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THE CRETACEOUS FORAMINIFERA OF NEW JERSEY.

PART II. ORIGINAL INVESTIGATIONS AND REMARKS.

BY ANTHONY WOODWARD, PH.D.

(*Presented April 6th*, 1894.)

After a number of years of close and careful study a vast amount of rough material has been worked over. I have succeeded in identifying twenty-six genera and fifty-nine species of Foraminifera from the cretaceous formation of New Jersey. The material examined was in part kindly sent to me by the late Prof. Geo. H. Cook, State Geologist of New Jersey, and collected by Dr. N. L. Britton; it was also received in part from Wm. E. Chase, of Franklin, N. J., and James Walker, of Brooklyn, N. Y., besides many other sources. I spent two days at Mullica Hill, a beautiful Quaker village, collecting marls from the terebratula, gryphæa beds, and the one just above it. From these beds I identified most of the species mentioned in this paper.

The marls from certain localities are very rich in *Nodosaria*, *Crislettaria*, and *Polymorphina*, especially those from Mullica Hill and the yellow limestone from Timber Creek. My most esteemed friend, the late H. B. Brady, F.R.S., of London, England, aided me greatly by verifying such species as I doubted.

LITUOLIDÆ.

Sub-family TROCHAMMINÆ.

TROCHAMMINA Parker and Jones.

TROCHAMMINA INFLATA Montagu, sp.

Nautilus inflatus Montagu. 1808. Test. Brit. Suppl. 81. pl. xviii. fig. 3.

Rotalina inflata Williamson. 1858. Rec. Foram. Gt. Brit. 50. pl. iv. figs. 93, 94.

Rotalina (*Trochammina*) *inflata* Parker and Jones. 1859. Ann. and Mag. Nat. Hist. ser. 3. iv. 347. fig. F.

Trochammina inflata. Carpenter. 1862. Introd. Foram. 141. pl. xi. fig. 5.

Trochammina squamata, var. *inflata* Parker and Jones. 1862. Introd. Foram. Appendix. 310.

Trochammina inflata Brady. 1865. Nat. Hist. Trans. Northd. and Durham. i. 95.

Trochammina inflata (?) Tate and Blake. 1876. Yorkshire Lias. 452. pl. xvii. fig 18.

Trochammina inflata Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 338. pl. xli. fig. 4. a–c.

Trochammina inflata Woodward and Thomas. 1893. Final Report Geol. Nat. Hist. Survey Minn. iii. 28. pl. D. fig. 31.

"Test free; trochoid or convex, depressed, rotaliform; consisting of about three convolutions, the outermost of which is formed of five or six very ventricose segments with deeply excavated septal lines. Inferior face somewhat concave, with sunken umbilicus; peripheral margin lobulated. Aperture small, arched; situate on the inferior side of the final segment, close to previous convolution, a little within the periphery. Color pale brown, the small primary segments much darker than the rest."—Brady, loc. cit.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare. Timber Creek, yellow limestone. Rare.

WEBBINA d'Orbigny.

WEBBINA RUGOSA d'Orbigny.

Webbina rugosa d'Orbigny. 1839. Foram. d. Iles Canaries. 125. pl. i. figs. 16–18.

Webbina rugosa d'Orbigny. 1846. Foram. Foss. Vien. 74. pl. xxi. figs. 11, 12.

Test depressed, elongate, twisted, white, above convex rugose, below complanate, with three pyriform chambers ; spinose, round aperture, peristome elevated, enlarged.

Locality. Timber Creek, in the yellow limestone. Rare. Also in the teredo bed. Rare.

TEXTULARIDÆ.

Sub-family TEXTULARINÆ.

TEXTULARIA Defrance.

Textularia agglutinans d'Orbigny.

Textularia agglutinans d'Orbigny. 1839. Foram. Cuba 144. pl. i. figs. 17, 18, 32–34.

Textularia agglutinans Seguenza. 1862. Atti dell' Accad. Gisenia. ser. 2. xviii. 112. pl. ii. fig. 4.

Plecanium sturi Karrer. 1864. Sitzungsb. d. K. Ak. Wiss. Wien. i. 704. pl. i. fig. 1.

Textularia agglutinans Parker and Jones. 1865. Phil. Trans. clv. 369. pl. xv. fig. 21.

Plecanium agglutinans Reuss. 1869. Sitzungsb. d. K. Ak. Wiss. Wien. lix. 452. pl. i. figs. 1, 2.

Textularia agglutinans G. M. Dawson. 1875. Report Geol. Resources 49th Parallel, British N. A. Boundary Comm. 79.

Textilaria agglutinans Moebius. 1880. Foram. von Mauritius. 93. pl. ix. figs. 1–8.

Textularia agglutinans Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 363. pl. xliii. figs. 1–3. vars. figs. 4, 12.

Textularia agglutinans Woodward and Thomas. 1885. Geol. Nat. Hist. Survey Minn. 13th Ann. Report. 167. pl. iii. figs. 6, 7.

Textularia agglutinans Tyrrell. 1890. Trans. Roy. Soc. Can. vii. 114.

Test elongate, conical, rugose, agglutinous (from grains of sand), white, laterally convex, posteriorly cuneate, segments large, the last convex, aperture semi-lunate.

Locality. Timber Creek, in the yellow limestone. Rare.

Textularia carinata d'Orbigny.

Textularia carinata d'Orbigny. 1826. Ann. Sci. Nat. vii. 263. No. 23.

Textularia carinata d'Orbigny. 1846. Foram. Foss. Vien. 247. pl. xiv. figs. 32–34.

Textularia lacera Reuss. 1851. Zeitschr. d. deutsch. geol. Gesell. iii. 84. pl. vi. figs. 52, 53.

Textularia attenuata Reuss. 1851. Zeitschr. d. deutsch. geol. Gesell. iii. 84. pl. vi. fig. 54.

Textilaria carinata, and *T. carinata*, var. *attenuata* Reuss. 1870. Sitzungsb. d. K. Ak. Wiss. Wien. lxii. 489. No. 1. Schlicht. 1870. Foram. Pietzpuhl. pl. xxxiii. figs. 1–4, 8, 9.

Textilaria carinata Hantken. 1875. Mitth Jahrb. d. k. ung. geol. Anst. iv. 66. pl. vii. fig. 8.

Textularia carinata Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 360. pl. xlii. figs. 15, 16.

Textularia carinata Woodward and Thomas. 1893. Final Report Geol. Nat. Hist. Survey Minn. iii. 30. pl. C fig. 11.

Test cuneiform, lingulata, convex, punctate, anteriorly dilate, truncate, posteriorly obtuse acuminate, laterally carinate, acute, lamellose ; foramina narrow, oblique, arcuate, marginate.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Quite rare.

Textularia gramen d'Orbigny.

Textularia gramen d'Orbigny. 1846. Foram. Foss. Vien. 248. pl. xv. figs. 4, 6.

Textularia gramen Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 365. pl. xliii. figs. 9, 10.

Test ovate-lingulate, compressed, punctate, anteriorly dilate, rotund, posteriorly obtuse, laterally angular, subcarinate ; with wide chambers, obliquely transverse, arcuate, somewhat convex.

Locality. Timber Creek, in the yellow limestone. Not common.

Textularia turris d'Orbigny.

Textularia turris d'Orbigny. 1840. Mém. Soc. géol. France. iv. 46. pl. iv. figs. 27, 28.

Textularia turris Parker and Jones. 1863. Ann. and Mag. Nat. Hist. ser. 3. xi. 97.
Textularia turris Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 366. pl. xliv. figs. 4, 5.
Textularia turris Woodward and Thomas. 1885. Geol. Nat. Hist. Survey Minn. 13th Ann. Report. 167. pl. iii. fig. 8.
Textularia turris (?) Tyrrell. 1890. Trans. Roy. Soc. Can. vii. 114.
Textularia turris Woodward and Thomas. 1893. Final Report Geol. Nat. Hist. Survey Minn. iii. 30. pl. C. figs. 9, 10.

Test elongate, conical, turriculate, rugose, non-compressed, posteriorly acuminate, anteriorly truncate; chambers complanate.

Locality. Timber Creek, in the yellow limestone and gryphæa bed. Not abundant.

Textularia sagittula Defrance.

"*Polymorphum sagittula*" Soldani. 1791. Testaceographia. i. 120. pl. cxxxiii. fig. T.
Textularia sagittula Defrance. 1824. Dict. Sci. Not. xxxii. 177; liii. 344; Atlas Conch. pl. xiii. fig. 5.
Textularia sagittula Blainville. 1825. Malacologie. 370. pl. v. fig. 5.
Textularia sagittula d'Orbigny. 1826. Ann. Sci. Nat. vii. 263. No. 20.
Textularia saulcyana d'Orbigny. 1839. Foram. Cuba. 137. pl. i. figs. 21, 22.
Textularia cuneiformis d'Orbigny. 1839. Foram. Cuba. 138. pl. i. figs. 37, 38.
Textularia nussdorfensis d'Orbigny. 1846. Foram. Foss. Vien. 243. pl. xiv. figs. 17–19.
Textularia bronniana d'Orbigny. 1846. Foram. Foss. Vien. 244. pl. xiv. figs. 20–22.
Textularia deperdita d'Orbigny. 1846. Foram. Foss. Vien. 244. pl. xiv. figs. 23–25.
Textularia prælonga Czjzek. 1847. Haidinger's Naturw. Abhandl. ii. 149. pl. xiii figs. 28–30.
Textularia acuta Reuss. 1849. Denkschr. d. K. Akad. Wiss. Wien. i. 381. pl. xlix. fig. 1.

Textularia cuneiformis Williamson. 1858. Rec. Foram. Gt. Br. 75. pl. vi. figs. 158, 159.

Textularia agglutinans, var. *sagittula* Parker and Jones. 1865. Phil. Trans. clv. 369 pl. xvii. fig. 77. a, b.

Textularia sagittula Brady. 1884. Report on Foram H. M. S. Challenger. Zool. ix. 361. pl. xlii. figs. 17, 18.

Test elongate, somewhat compressed, very rugose, posteriorly acuminate-carinate, anteriorly subcylindrical-truncate; with narrow chambers, arcuate, limbate above, aperture linear.

Locality. New Egypt, in the green marl. Rare. Timber Creek, in the gryphæa bed. Quite rare.

SPIROPLECTA Ehrenberg.

Spiroplecta americana Ehrenberg.

Spiroplecta americana Ehrenberg. 1854. Mikrogeologie. pl. xxxii. I. figs. 13, 14; II. fig. 25.

Spiroplecta americana Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 376. pl. xlv. fig. 24. a, b.

Spiroplecta americana Woodward and Thomas. 1885. Geol. Nat. Hist. Survey Minn. 13th Ann. Report. 168 pl. iii. fig. 9.

Spiroplecta americana Woodward and Thomas. 1893. Final Report Geol. Nat. Hist. Survey Minn. iii. 31. pl. C. figs. 12, 13, 14.

"The test is usually much compressed, and widens rapidly towards the distal end; the lateral edges are thin and slightly lobulated, the chambers somewhat inflated, and the septal lines correspondingly depressed on the exterior; the walls are thin and smooth."—Brady, loc. cit.

Locality. Timber Creek, in the gryphæa bed. Rare.

GAUDRYINA d'Orbigny.

Gaudryina pupoides d'Orbigny.

Gaudryina pupoides d'Orbigny. 1840. Mém. Soc. géol. France. iv. 44. pl. iv. figs. 22–24.

Gaudryina pupoides d'Orbigny. 1846. Foram. Foss. Vien. 197. pl. xxi. figs. 34–36.

Gaudryina subglabra Gümbel. 1868. Abh. d. K. bayer. Akad. Wiss. II. cl. x. 602. pl. i. fig. 4.

Gaudryina pupoides Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 378. pl. xlvi. figs. 1–4.

Gaudryina pupoides Woodward and Thomas. 1885. Geol. Nat. Hist. Survey Minn. 13th Ann. Report. 168. pl. iii. fig. 10.

Gaudryina pupoides Woodward and Thomas. 1893. Final Report Geol. Nat. Hist. Survey Minn. iii. 31. pl. C. figs. 15, 16.

Test elongated, rugose, (young) rotund, (adult) compressed; spire obtuse; chambers convex, (young) narrow, transversely oblong, (adult) globular.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Quite rare.

VERNEUILINA d'Orbigny.

Verneuilina triquetra Münster, sp.

Textularia triquetra Münster. 1838 (in Römer's paper). Neues Jahrb. für Minn. etc. 384. pl. iii. fig. 19.

Textularia triquetra Reuss. 1845. Verstein. Böhm. Kreid. pt. 1. 39. pl. xiii. fig. 77.

Textularia atlantica Bailey. 1851. Smithsonian Contrib. ii. art. 3. 12. figs. 38–42.

Textularia (*Verneuilina*) *triquetra* Parker and Jones. 1863. Ann. and Mag. Nat. Hist. ser. 3. xi. 92.

Verneuilina triquetra Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 383. pl. xlvii. figs. 18–20.

Test carinate, acutely triangular with a curved lateral side (or face) in the centre, so that a cross section presents the appearance of a triangle, with somewhat concave sides. On every side seven to eight very low, somewhat rough chambers, whose sutures are slightly elevated, the uppermost chamber somewhat arched; aperture a slit on the inner side of the last chamber, parallel to a side face of the pyramid.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Very abundant. Timber Creek, in the gryphæa bed. Abundant.

TRITAXIA Reuss.

Tritaxia tricarinata Reuss.

Textularia tricarinata Reuss. 1845. Verstein. Böhm. Kreid. i. 39. pl. viii. fig. 60.

Verneuilina dubia Reuss. 1850. Haidinger's Naturw. Abhandl. iv. 40. pl. iv. fig. 3.

Tritaxia tricarinata Reuss. 1860. Sitzungsb. d. K. Ak. Wiss. Wien. xl. 228. pl. xii. figs. 1, 2.

Tritaxia tricarinata Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 389. pl. xlix. figs. 8, 9.

Test very rough, elongate elliptical, triangular, tricarinate, on either side attenuate, walls somewhat concave, sutures obsolete, aperture small, subelliptical.

Locality. Timber Creek, in the yellow limestone. Quite rare.

CLAVULINA d'Orbigny.

Clavulina communis d'Orbigny.

Clavulina communis d'Orbigny. 1826. Ann. Sci. Nat. vii. 268. No. 4.

Clavulina communis d'Orbigny. 1846. Foram. Foss. Vien. 196. pl. xii. figs. 1, 2.

Verneuilina communis Jones and Parker. 1860. Quart. Journ. Geol. Soc. xvi. 303. No. 82.

Clavulina communis Fischer. 1870. Actes Soc. Linn. Bordeaux. xxvii. 393. No. 33.

Verneuilina communis Van den Broeck. 1876. Ann. Soc. Belg. Micr. ii. 136. pl. iii. fig. 14.

Clavulina communis Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 394. pl. xlviii. figs. 1–13.

Test elongate, clavate, rugose, cylindrical anteriorly, posteriorly inflated, obtuse, convex chambers, terminal one anteriorly subacuminate.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Common. Timber Creek, teredo bed. Abundant.

Sub-Family BULIMINÆ.

BULIMINA d'Orbigny.

Bulimina pupoides d'Orbigny.

Bulimina pupoides d'Orbigny. 1846. Foram. Foss. Vien. 185. pl. xi. figs. 11, 12.

Bulimina pupoides Williamson. 1858. Rec. Foram. Gt. Br. 62. pl. v. figs. 124, 125.

Bulimina tortilis Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 338. pl. viii. fig. 3.

Bulimina presli, var. *pupoides* Parker and Jones. 1862. Introd. Foram. Appendix. 311.

Bulimina pupoides Terrigi. 1880. Atti dell' Accad. Pont. xxxiii. 193. pl. ii. figs. 30–34.

Bulimina pupoides Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 400, 401. pl. l. fig. 15. a, b.

Bulimina pupoides Woodward and Thomas. 1885. 13th Ann. Report Geol. Nat. Hist. Survey Minn. 169. pl. iii. fig. 11.

Bulimina pupoides Tyrrell. 1890. Trans. Roy. Soc. Can. 114.

Bulimina pupoides Woodward and Thomas. 1893. Final Report Geol. Nat. Hist. Survey Minn. iii. 32. pl. C. figs. 20–24.

Test oblong; obtuse, especially at the inferior lateral surface; composed of numerous segments, arranged in an indistinct spiral, and exhibiting a tendency to form three oblique vertical rows; segments remarkably ventricose and prominent; the anterior one usually more oblong than the rest, from its anterior part not being embraced, as all the preceding ones, by the next segment. Septal plane convex; semilunar. Septal orifice single, placed near the umbilical border of the septal plane, and usually characterized by a curious obliquity at its part, owing to the two lips of the orifice not meeting at their umbilical extremities, but passing one behind the other.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare. Fragments only.

Bulimina pyrula d'Orbigny.

Bulimina caudigera d'Orbigny. 1826. Ann. Sci. Nat. vii. 270. No. 16; Modèle No. 68.

Bulimina ovula d'Orbigny. 1839. Foram. Amér. Mérid. 51. pl. i. figs. 10, 11.

Bulimina pyrula d'Orbigny. 1846. Foram. Foss. Vien. 184. pl. xi. figs. 9, 10.

Bulimina auriculata Bailey. 1851. Smithsonian Contrib. ii. Art. 3. 12. figs. 25–27.

Bulimina turgida Id. Ibid. 12. figs. 28–31.

Guttulina prunella Costa. 1856. Atti dell' Accad. Pont. vii. 274. pl. xiii. figs. 32, 33, 37, 38.
Guttulina mutabilis Id. Ibid. 275. pl. xviii. figs. 1–3.
Bulimina auriculata Dawson. 1859. Canad. Nat. iv. 31. fig. 22.
Bulimina auriculata Id. 1860. Can. Nat. and Geol. v. 190.
Bulimina presli, var. *pyrula* Parker and Jones. 1865. Phil. Trans. clv. 372. pl. xv. figs. 8, 9.
Bulimina pyrula Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 399. pl. l. figs. 7–10.
Bulimina pyrula Whiteaves. 1887. Trans. Roy. Soc.Can. iv. 114.

Test ovate, anteriorly and posteriorly acuminate, smooth, short spire, obtuse ; with three narrow convolutions ; with three somewhat convex segments.

Locality. Timber Creek, teredo bed. Rare.

PLEUROSTOMELLA Reuss.

Pleurostomella subnodosa Reuss.

Nodosaria nodosa (pars) Reuss. 1845. Verstein. Böhm. Kreid. pt. 1. 28. pl. xiii. fig. 22 (*fide* Reuss).
Dentalina subnodosa (pars) Id. 1850. Haidinger's Naturw. Abhandl. iv. 24. pl. i. fig. 9 (*fide* Reuss).
Pleurostomella subnodosa Id. 1860. Sitzungsb. d. K. Ak. Wiss. Wien. xl. 204. pl. viii. fig. 2. a, b.
Pleurostomella subnodosa Marsson. 1878. Mittheil. Naturw. Vereine Neu-Vorpom. u. Rügen. x. 133.
Pleurostomella subnodosa Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 412. pl. lii. figs. 12, 13.

Test elongated, nearly straight ; chambers quite regularly increasing, slightly convex, the last one the largest, convex, shortly acute ; the first chamber smallest, rather obtuse ; aperture naked.

Locality. Timber Creek, gryphæa bed. Rare.

BOLIVINA d'Orbigny.

Bolivina punctata d'Orbigny.

Bolivina punctata d'Orbigny. 1839. Foram. Amér. Mérid. 61. pl. viii. figs. 10–12.
Bolivina antiqua d'Orbigny. 1846. Foram. Foss. Vien. 240. pl. xiv. figs. 11–13.

Grammostomum polystigma Ehrenberg. 1854. Mikrogeologie. pl. xix. fig. 84.

Grammostomum caloglossa Ehrenberg. 1854. Mikrogeologie. pl. xxv. figs. 17, 18.

Bolivina punctata Brady. 1864. Trans. Linn. Soc. Lond. xxiv. 468. pl. xlviii. fig. 9. a, b.

Bulimina presli, var. (*Bolivina*) *punctata* Parker and Jones. 1865. Phil. Trans. clv. 376. pl. xviii. fig. 74.

Bolivina elongata Hantken. 1875. Mittheil. Jahrb. d. K. ung. geol. Anstalt. iv. 65. pl. vii. fig. 14.

Bolivina antiqua Terrigi. 1880. Atti dell' Accad. Pont. xxxiii. 196. pl. ii. fig. 40.

Bolivina punctata Moebius. 1880. Foram. von Mauritius. 94. pl. ix. figs. 9, 10.

Bulimina (*Bolivina*) *punctata* Goës. 1882. Kongl. Sv. Vet. Akad. xxix. 69. pl. iv. figs. 114–126.

Bolivina punctata Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 417. pl. lii. figs. 18, 19.

Bolivina punctata Woodward and Thomas. 1885. Geol. Nat. Hist. Survey Minn. 13th Ann. Report. 169. pl. iii. fig. 12.

Bolivina punctata Woodward and Thomas. 1893. Final Report Geol. Nat. Hist. Survey Minn. iii. 34. pl. C. figs. 27, 28.

Test elongated, compressed, conical, obtuse anteriorly, acuminate posteriorly, white, punctate, sub-carinate on sides; with numerous oblique undulate segments, the last obtuse; aperture simple.

Locality. Lower marl bed, light gray, sandy marl at Bruere's pits, Crosswick's Creek. Rare.

LAGENIDÆ.

Sub-family LAGENINÆ.

LAGENA Walker and Boys.

Lagena globosa Montagu, sp.

"*Serpula* (*Lagena*) *lævis globosa*" Walker and Boys. 1784. Test. Min. 3. pl. i. fig. 8.

"*Ossicula madreporaria*" Soldani. 1795. Testaceographia. i. pt. 3. 245. pl. clxxii. figs. B, C, etc.

Vermiculum globosum Montagu. 1803. Test. Brit. 523.
Oolina inornata d'Orbigny. 1839. Foram. Amér. Mérid. 21. pl. v. fig 13.
Oolina simplex Reuss. 1851. Haidinger's Naturw. Abhandl. iv. 22. pl. i. fig. 2.
Miliola sphæroidea Ehrenberg. 1854. Mikrogeologie. pl. xxxiii. fig. 1.
Cenchridium oliva Ehrenberg. 1854. Mikrogeologie. pl. xxiv. figs. 3, 4.
Phialina oviformis Costa. 1856. Atti dell' Accad. Pont. vii. 123. pl. xi. figs. 8, 9.
Fissurina obtusa Egger. 1857. Neues Jahrb. für Min. etc. 270. pl. v. figs. 16–19.
Entosolenia globosa Parker and Jones. 1857. Ann. and Mag. Nat. Hist. ser. 2. xix. 278. pl. xi. figs. 25–29.
Entosolenia globosa Williamson. 1858. Rec. Foram. Gt. Br. 8. pl. i. figs. 15, 16.
Fissurina solida Seguenza. 1862. Foram. Monotal. Mess. 56. pl. i. fig. 42.
Entosolenia globosa Dawson. 1859. Can. Nat. and Geol. iv. 28. figs. 4, 5.
Entosolenia globosa Dawson. 1862. Proc. Portland Soc. Nat. Hist. i. 83.
Fissurina rugosula Seguenza. 1862. Foram. Monotal. Mess. 56. pl. i. fig. 43.
Lagena sulcata, var. (*Entosolenia*) *globosa* Parker and Jones. 1865. Phil. Trans. clv. 348. pl. xiii. fig. 37; pl. xvi. fig. 10.
Lagena globosa Jones, Parker, and Brady. 1866. Monograph of the Foram. of the Crag. 32. pl. i. fig. 32.
Cenchridium aargovense Kübler. 1870. Foram. Schweiz. Jura. 13. pl. ii. I. fig. 2.
Lagena parkinsoni Kübler. 1870. Foram. Schweiz. Jura. 17. pl. ii. III. fig. 1.
Lagena minutissima Kübler. 1870. Foram. Schweiz. Jura. 19, 21. pl. ii. IV. fig. 1.
Lagenulina globosa Terquem. 1876. Anim. sur la Plage de Dunkerque. fasc. 2. 67. pl. vii. figs. 3, 4.
Lagena globosa Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 452. pl. lvi. figs. 1, 2, 3.

Test ovato-globose, sometimes projecting slightly at the apex; smooth, and without surface-marking. Tube entosolenian. Walls thin and hyaline.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare.

Sub-family NODOSARINÆ.

NODOSARIA Lamarck.

Nodosaria (D.) communis d'Orbigny.

Nodosaria (*Dentalina*) *communis* (?) d'Orbigny. 1826. Ann. Sci. Nat. vii. 254. No. 35.

Dentalina communis d'Orbigny. 1840. Mém. Soc. géol. France, iv. 13. pl. i. fig. 4.

Nodosaria linearis Römer. 1842. Verst. Nordd. Kreidegeb. 95. pl. xv. fig. 5.

Nodosaria communis Reuss. 1845. Verstein. Böhm. Kreid. pt. i. 28. pl. xii. fig. 21.

Nodosaria legumen Id. Ibid. 28. pl. xiii. figs. 23, 24.

Dentalina inornata d'Orbigny. 1846. Foram. Foss. Vien. 44. pl. i. figs. 50, 51.

Dentalina badenensis Id. Ibid. 44. figs. 48, 49.

Dentalina ferstliana Czjzek. 1847. Haidinger's Naturw. Abhandl. ii. 140. pl. xii. figs. 10–13.

Dentalina intermedia Corn. 1848. Nouv. Foss. Microsc. Cret.; Mém. Soc. géol. France. ser. 2. iii. 251. pl. i. fig. 20.

Dentalina gracilis Alth. 1849. Umgeb. Lemb.; Haidinger's Naturw. Abhandl. iii. (2) 269. pl. xiii. fig. 27.

Dentalina mutabilis Bailey. 1850. Smithsonian Contrib. ii. Art. 3. 10. fig. 7.

Marginulina ensis Reuss. 1851. Haid. Nat. Abhandl. iv. p. ii. figs. 16–18.

Dentalina haueri Neugeboren. 1856. Denkschr. d. K. Akad. Wiss. xii. 81. pl. iii. fig. 12.

Dentalina orbignyana Id. Ibid. pl. iii. figs. 1–3.

Dentalina subarcuata Williamson. 1858. Rec. Foram. Gt. Brit. 18. pl. ii. figs. 40, 41.

Dentalina torta Terquem. 1858. Foram. du Lias. 1re mém. 599. pl. ii. fig. 6.

Dentalina vetusta Terquem. Ibid. 598. pl. ii. 4.
Dentalina legumen Reuss. 1860. Sitzungsb. d. K. Akad. Wiss. Wien. xl. 187. pl. iii. fig. 5.
Dentalina intermedia Id. Ibid. 186. pl. ii. fig. 8.
Dentalina communis Id. Ibid. 186.
Dentalina colligata Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 334. pl. vii. fig. 4.
Dentalina deflexa Reuss. 1862. Sitzungsb. d. K. Akad. Wiss. Wien. xlvi. 43. pl. ii. fig. 19.
Dentalina inornata Id. 1863. Ibid. xlviii. 45. pl. ii. fig. 18.
Dentalina boettcheri Id Ibid. 44. pl. ii. fig. 17.
Dentalina æqualis Karrer. 1865. Foram. Grünsandstein. N. Zeeland; Novara Reise. geol. ii. 74. pl. xvi. fig. 1.
Dentalina communis Jones, Parker, and Brady. 1866. Monograph of the Foram. of the Crag. 58. pl. i fig. 13–18, 20; pl. iv. fig. 10.
Marginulina ensis Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 335.
Nodosaria neugeboreni Schwager. 1866. Novara Exped. geol. ii. 232. pl. vi. fig. 67.
Nodosaria gracilescens Id. Ibid. 234. pl. vi. fig. 70.
Dentalina intorta Terquem. 1870. Foram. du Syst. Oolith. 3ième mém. 262. pl. xxvii. figs. 26–34.
Dentulina budensis Hantken. 1875. Mittheil. Jahrb. d. K. ung. geol. Anstalt. iv. 34. pl. iii. fig. 12.
Nodosaria (*D.*) *communis* Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 504. pl. lxii figs. 19–22.

Test elongated, arched, smooth; posteriorly acuminate, caudate; numerous chambers, oblique, last very convex, acuminate, first convex; sutures subcomplanate; very small aperture, radiate.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Not abundant. New Egypt, green marl. Fragments. Lower marl bed, gray sandy marl at Bruere's pits, Crosswick's Creek. Fragments. Timber Creek, in the yellow limestone. Fragments. Teredo bed. Quite abundant. Gryphæa bed. Not rare.

Nodosaria (D.) filiformis d'Orbigny.

"*Orthoceratia filiformia aut capillaria*" Soldani. 1798. Testaceographia. ii. 35. pl. x. fig. e.

Nodosaria filiformis d'Orbigny. 1826. Ann. Sci. Nat. vii. 253. No. 14.

Dentalina acutissima d'Orbigny. 1839. Foram. Amér. Mérid. 23. pl. iii. fig. 15.

Dentalina acuta Id. Ibid. fig. 16.

Dentalina gracilis Id. 1840. Mém. Soc. géol. France. iv. 14. pl. i. fig. 5.

Dentalina elegans Id. 1846. Foram. Foss. Vien. 45. pl. i. figs. 52–56.

Dentalina reussi Neugeboren. 1856. Denkschr. d. K. Akad. Wiss. Wien. xii. 85. pl. iii. figs. 6, 7.

Dentalina prælonga Costa. 1856. Atti dell' Accad. Pont. vii. 163. pl. xii. fig. 21.

Dentalina vetustissima Terquem. 1858. Foram. du Lias. 1ière mém. 600. pl. ii. fig. 8.

Dentalina baccata Id. Ibid. 601. pl. ii. fig. 9.

Dentalina pseudomonile Id. Ibid. 606. pl. ii. fig. 18.

Dentalina gracilis Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 334.

Nodosaria elegans Schwager. 1866. Novara Exped. géol. Theil ii. 233. pl. vi. fig. 68.

Dentalina filiformis Parker, Jones, and Brady. 1871. Ann. and Mag. Nat. Hist. ser. 4. viii. 156. pl. ix. fig. 48.

Nodosaria (*D.*) *filiformis* Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 500. pl. lxiii. figs. 3–5.

Test elongate, arcuate, smooth, shining white, anteriorly obtuse, posteriorly acuminate, very acute, with numerous chambers, laterally semi-distinct; aperture round simple.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare. Timber Creek, in the yellow limestone. Fragments only. Teredo bed. Rare.

Nodosaria obliqua Linné, sp.

"*Orthoceras minimum*," etc. Gaultieri. 1742. Index Test. pl. xix. fig. N.

Nautilus obliquus Linné. 1767. Syst. Nat. 12th ed. 1163. 281 ; 1788. Ibid. 13th (Gmelin's) ed. 3372. No. 14.

Nautilus jugosus Montagu. 1803. Test. Brit. 198 pl. xiv. fig. 4.

Orthocera obliqua Lamarck. 1822. Anim. sans Vert. vii. 594. No. 4.

Nodosaria sulcata Nilsson. 1827. Petrif. Suec. 8. pl. ix. fig. 19.

Nodosaria elegans Roemer. 1838. Neues. Jahrb. für Min. etc. 382. pl. iii. fig. 1.

Dentalina bifurcata Reuss. 1849. Denkschr. d. K. Akad. Wiss. Wien. i. 367. pl. xlvi. fig. 10.

Dentalina primæva d'Orbigny. 1850. Prod. Paléont. i. 242. No. 260.

Dentalina kingii Jones. 1850. King's Monogr. Permian Foss. 17. pl. vi. figs. 2, 3.

Dentalina steenstrupi Reuss. 1855. Zeitschr. d. deutsch. geol. Gesellsch. vii. 268. pl. viii. fig. 14, a.

Dentalina sulcata Id. Ibid. 269. pl. viii. fig. 14, b.

Dentalina baltica Id. Ibid. 269. pl. viii. fig. 15.

Dentalina bifurcata Costa. 1856. Atti dell' Accad. Pont. vii. 162. pl. xii. fig. 27.

Nodosaria mutabilis Id. Ibid. 150. pl. xiii. fig. 1.

Nodosaria siphunculoides Costa. 1857. Mém. Accad. Sci. Nap. ii. 135. pl. i. fig. 27.

Nodosaria (*Dentalina*) *obliqua* Parker and Jones. 1859. Ann. and Mag. Nat. Hist. ser. 3. iii. 482.

Dentalina pulchra Gabb. 1860. Journ. Acad. Nat. Sci. ser. 2. iv. 402, 403. pl. lxix. figs. 40, 41.

Dentalina steenstrupi Reuss. 1861. Sitzungsb. d. K. Akad. d. Wiss. xliv. 326.

Dentalina confluens Reuss. Id. Ibid. 335. pl. vii. fig. 5.

Nodosaria siphunculoides Costa. 1857. Foram. Foss. Marne Terziar Messina. 9. pl. i. fig. 27.

Dentalina lineata Reuss. 1864. Sitzungsb. d. K. Akad. d. Wiss. l. 22. pl. iv. fig. 11.

Dentalina schwarzii Karrer. 1864. Sitzungsb. d. K. Akad. d. Wiss. l. 15. pl. i. fig. 5.

Dentalina obliqua Jones, Parker, and Brady. 1866. Monograph of the Foram. of the Crag. 54. pl. i. fig. 9.

Nodosaria obliqua Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 513. pl. lxiv. figs. 20–22.
Nodosaria obliqua Meyer. 1886. Bull. Geol. Survey Ala. 85. pl. i. fig. 31.

Test elongated, arcuate, tapering; composed of numerous (six to fifteen) chambers, which are subcylindrical and more or less ventricose, with the septal lines generally constricted, and the surface covered with riblets, varying in number and size in different specimens.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Very common. Timber Creek, teredo bed. Not abundant. Near Harrisonville, middle bed, associated with echinoderms. Common.

This is the species that Gabb speaks of finding, and described as a new species *Dentalina pulchra*, from the marl near Mullica Hill. Also *N. sulcata* of Nilsson, who H. v. Credner mentions in Die Kreide von New Jersey d. d. geol. Ges. xiii. 1870, as occurring common in the bryozoan bed at Brownville and Turtle Hill.

Nodosaria radicula Linné, sp.

"*Cornu Hammonis erectum*" Plancus. 1739. Conch. Min. 14. pl. i. fig. 5.
Nautilus radicula Linné. 1767. Syst. Nat. 12th ed. 1164. 285; 1788. Ibid. 13th (Gmelin's) ed. i. pt. 6. 3373. No. 18.
Nautilus radicula Montagu. 1803. Test. Brit. 197. pl. vi. fig. 4.
Nodosaria radicula d'Orbigny. 1826. Ann. Sci. Nat. vii. 252. No. 3; Modèle No. 1.
Nodosaria geinitziana Neugeboren. 1852. Verhandl. u. Mitth. siebenb. Vereins f. Nat. iii. 37. pl. i. fig. 1.
Nodosaria glandulinoides Id. Ibid. 37. pl. i. fig. 2.
Nodosaria inconstans Id. Ibid. 38. pl. i. figs. 6, 7.
Glandulina tenuis Bornemann. 1854. Lias-formation. 31. pl. ii. fig. 3. a, b.
Glandulina major Id. Ibid. 31. pl. ii. fig. 4. a, b.
Nodosaria geinitzi Reuss. 1854. Jahresb. d. Wetterauer Gesellsch. 1851–53. 77. fig. 12.
Glandulina elegans Neugeboren. 1856. Denkschr. d. K. Akad. Wiss. Wien. 69. pl. i. fig. 5.

Glandulina reussi Id. Ibid. 69. pl. i. fig. 6.
Nodosaria beyrichi Id. Ibid. 72. pl. i. figs. 7–9.
Nodosaria incerta Id. Ibid. 72. pl. i. figs. 10, 11.
Nodosaria radicula Jones and Parker. 1860. Quart. Journ. Geol. Soc. xvi. 453. figs. 1–5 (Triassic).
Nodosaria geinitzi Richter. 1855. Zeitschr. d. deutsch. Geol. Gesellsch. vii. 532. pl. xxvi. fig. 26.
Nodosaria kirbyi Richter. 1861. Geinitz's Dyas. 121. pl. xx. fig. 30.
Glandulina conica Terquem. 1862. Foram. du Lias. 2ième mém. 435. pl. v. fig. 10. a, b.
Nodosaria jonesi Reuss. 1862. Sitzungsb. d K. Akad. Wiss. Wien. xlvi. 89. pl. xii. fig. 6.
Nodosaria claviformis Terquem. 1866. Foram. du Lias. 6ième mém. 447. pl. xix. figs. 17, 18.
Nodosaria radicula Brady. 1867. Proc. Somerset Arch. and Nat. Hist. Soc. xiii. 106. pl. i. fig. 4.
Nodosaria conferta Schmid. 1867. Neues Jahrb. für Min. Jahrg. 1857. 585. pl. vi. fig. 49.
Nodosaria radicula Brady. 1876. Pal. Soc. xxx. 124. pl. x. figs. 6–16.
Nodosaria radicula Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 495. pl. lxi. figs. 28–31.

Test cylindrical, tapering, composed of several subglobose segments united in a straight line. Surface smooth more or less. A good typical specimen of *Nodosaria radicula* has four or more segments, rarely as many as eight; the segments are subglobular in form, regularly but only slightly increasing in size, from the earliest to the last formed, and quite symmetrically joined end to end.

Locality. Timber Creek, in the yellow limestone. Rare.

Nodosaria raphanus Linné, sp.

"*Cornu Hammonis erectum striatum*" Plancus. 1739. Conch. Min. 15. pl. i. fig. 6.
"*Orthoceras minimum,*" etc. Gaultieri. 1742. Index Test. pl. xix, fig. L.
Nautilus raphanus Linné. 1767. Syst. Nat. 12th ed. 1164, 283; 1788. Ibid. 13th (Gmelin's) ed. 3372. No. 16.

"*Orthoceratia seu tubuli*" Soldani. 1791. Testaceographia. i. pt. 2. 91. pl. xciv. figs. T, V.

Nautilus costatus Montagu. 1803. Test. Brit. 199. pl. xiv. fig. 5.

Nautilus costatus, var. Montagu. 1808. Test. Brit. Suppl. 83. pl. xix. fig. 2.

Orthocera raphanus Lamarck. 1822. Anim. sans Vert. vii. 593. No. 1; Tabl. Encycl. et Méth. pl. cccclxv. fig. 2. a, b, c.

Nodosaria scalaris d'Orbigny. 1826. Ann. Sci. Nat. vii. 253. No. 18.

Nodosaria rapa Id. Ibid. 253 No. 27.

Nodosaria obscura Reuss. 1845. Verstein. böhm. Kreid. pt. 1. 26. pl. xiii. figs. 7–9.

Nodosaria bolli Reuss. 1855. Zeitschr. d. deutsch. geol. Gesellsch. vii. 265. pl. viii. fig. 6.

Nodosaria propinqua Costa. 1856. Atti dell' Accad. Pont. vii. 151. pl. xiii. fig. 2.

Nodosaria turgidula Costa. 1856. Atti dell' Accad. Pont. vii. 152. pl. xiii. fig. 3.

Nodosaria raphanus Parker and Jones. 1859. Ann. and Mag. Nat. Hist. ser. 3. iii. 477.

Dentalina pulchra Gabb. 1860. Jour. Acad. Sci. Phila. n. s. iv. 402. pl. lxix figs. 40, 41.

Nodosaria bactroides Reuss. 1862. Sitzungsb. d. K. Akad. Wiss. Wien. xlvi. 37. pl. ii. fig. 5.

Nodosaria lamelloso-costata Id. Ibid. 38. pl. ii fig. 6.

Nodosaria prismatica Id. Ibid. 36. pl. ii. fig. 7.

Nodosaria raphanus Silvestri. 1872. Nodos. Foss. e Viv. d'Ital. 43. pl. iv. figs. 67–81.

Phonemus (*Dentalina*) *pulcher* Meek. 1864. Smithsonian Inst. Mis. Coll. 177. p. 1. 1868. Appendix A. Geology of New Jersey. 721.

Nodosaria raphanus Jones, Parker, and Brady. 1866. Monograph. Foram. of the Crag 49. pl. i. figs. 4, 5, 22, 23.

Nodosaria obscura Reuss. 1874. Das Elbthalgebirge in Sachsen. pt. ii. 81. pl. xx. fig. 14.

Nodosaria raphanus Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 512. pl. lxiv. figs 6–10.

Shell straight, subcylindrical, tapering, composed of a few larg-

ish chambers, and externally ribbed from end to end by stout parallel ridges. The constrictions marking the septal lines are sometimes concealed by overgrowing longitudinal costæ. Liable to become either curved or compressed, or both, with more or less eccentric aperture.

Locality. Timber Creek, in the teredo bed. Rare.

Nodosaria raphanistrum Linné, sp.

Nautilus raphanistrum Linn. 1758. Syst. Nat. 10th ed. 710. No. 242; 1767. 12th ed. 1163. No. 282.
Orthocera raphanistrum Lamarck. 1822. An. s. Vert. 594. No. 3.
Nodosaria bacillum Defrance. 1825. Dict. Sci. Nat. xxxv. 127; xxvi. 487; Atlas Conch. 13. fig. 4.
Nodosaria zippei Reuss. 1844. Kreidegebirg. 210; 1845. Verst. böhm. Kreid. i. 25. pl. viii. figs. 1–3.
Nodosaria bacillum d'Orbigny. 1846. For. Foss. Vien. 40. pl. i. figs. 40–47.
Nodosaria raphanus Parker and Jones. 1860. Quart. Journ. Geol. Soc. xvi. 453. pl. xix. fig. 10.
Nodasaria spectrum Reuss. 1862. Sitzungsb. Akad. Wien. Math. Nat. Cl. xlvi. 37. pl. ii. fig. 3.
Nodosaria biformis, *N. bactridium* Reuss. 1866. Denks. Akad. Wien. xxv. 14. pl. i. figs. 23–25.
Nodosaria raphanistrum Jones, Parker, and Brady. 1866. Foram. of the Crag. 50. pl. i. figs. 6–8.
Nodosaria raphanistrum Sherborn and Chapman. 1886. Journ. Roy. Mic. Soc. ser. 2. vi. 749. pl. xiv. fig. 37.

Test long, straight, cylindrical, many chambered; septa more or less constricted; surface ornamented by numerous stout parallel ribs running from end to end of the shell.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Common. Also at Timber Creek, yellow limestone. Rare. Gryphæa bed. Rare.

Nodosaria scalaris Batsch, sp.

"*Orthocerata striata microscopica*" Soldani. 1780. Saggio Oritt. 107. pl. v. figs. L, A, B, C, D; pl. viii. fig. CC.
"*Orthoceratia flosculi*" Soldani. 1791. Testaceographia. i. pt. 2. 91. pl. xcv. figs. B–M.

"*Polymorphia pineiformia*" Soldani. 1791. Ibid. 118. pl. cxxvii. fig. C.

Nautilus (*Orthoceras*) *scalaris* Batsch. 1791. Conchyl. des Seesandes. No. 4. pl. ii. fig. 4. a, b.

Nodosaria longicauda d'Orbigny. 1826. Ann. Sci. Nat. vii. 254. No. 28.

Nodosaria sulcata Id. Ibid. 253. No. 21.

Nodosaria candei d'Orbigny. 1839. Foram. Cuba. 44 pl. i. figs. 6, 7.

Nodosaria striaticollis d'Orbigny. 1839. Foram. Canaries. 124. pl. i. figs. 2–4.

Lagena williamsoni (?) Harvey and Bailey. 1853. Proc. Acad. Phila. vi. 431.

Nodosaria tenuicostata Costa. 1856. Atti dell' Accad. Pont. vii. 156. pl. xii. fig. 5; pl. xvi. figs. 8–13.

Nodosaria reussi Id. Ibid. 155. pl. xvi. fig. 5.

Nodosaria annulata Costa. 1857. Mém. Accad. Sci. Nap. ii. 139. pl. i. fig. 16.

Nodosaria radicula Williamson. 1858. Rec. Foram. Gt. Br. 15. pl. ii. figs. 36–38.

Nodosaria scalaris Parker and Jones. 1865. Phil. Trans. clv. 340. pl. xvi. fig. 2. a, b, c.

Nodosaria subradicula Schwager. 1866. Novara Exped. geol. ii. 222. pl. v. fig. 50.

Nodosaria longicauda Silvestri. 1872. Nodos. Foss. e Viv. d'Ital. 58. pl. v. figs. 101–127.

Nodosaria scalaris Brady. 1884. Report on Foram. H M. S. Challenger. Zool. ix. 510. pl. lxiii. figs. 28–31; var. pl. lxiv. figs. 16–19.

"Test is straight; the segments comparatively few, generally from three to six in the adult shell and never more than eight, inflated or subglobular, and increasing rapidly, though not always regularly, in size. The final chamber is drawn out into an apertural tube of some length with a terminal phialine lip, and the opposite extremity of the test is commonly mucronate. The superficial costæ vary both as to number and thickness, and are frequently more numerous and less strongly marked than shown by the figures.'—Brady, loc. cit.

Locality. Stratton's marl pit, near Mullica Hill, in the shell

layers of the green marl. Frequent. Timber Creek, in the yellow limestone. Quite rare.

Nodosaria (D.) soluta Reuss.

Dentalina oligostegia Reuss. 1850. Haidinger's Naturw. Abhandl. iv. 25. pl. ii. fig. 10.
Dentalina lilli Id. Ibid. 25. pl. ii. fig. 11.
Dentalina soluta Reuss. 1851. Zeitschr. d. deutsch. geol. Gesellsch. iii. 60. pl. iii. fig. 4. a, b.
Dentalina globifera Reuss. 1855. Sitzungsb. d. K. Ak. Wiss. Wien. xviii. 223. pl. i. fig. 3.
Nodosaria soluta Bornemann. 1855. Zeitschr. d. deutsch. geol. Gesellsch. vii. 322. pl. xii. fig. 12.
Dentalina globuligera Neugeboren. 1856. Denkschr. d. K. Akad. Wiss. Wien. xii. 81. pl. ii. fig. 10.
Nodosaria ovularis Costa. 1857. Mem. Accad. Sci. Napoli. ii. 141. pl. i. figs. 8, 9.
Dentalina distincta Reuss. 1860. Sitzungsb. d. K. Akad. Wiss. Wien. xl. 184. pl. ii. fig. 5.
Dentalina catenula Id. Ibid. 185. pl. iii. fig. 6.
Dentalina discrepans Id. Ibid. 184. pl. iii. fig. 7.
Dentalina soluta Stache. 1864. Novara Exped. geol. i. Paläont. 203. pl. xii. fig. 29.
Nodosaria (*D.*) *grandis* Reuss. 1865. Denkschr d. K. Akad. Wiss. Wien. xxv. 131. pl. i. figs. 26–28.
Nodosaria (*D.*) *soluta* Id. Ibid. 131. pl. ii. figs. 4–8.
Nodosaria (*D.*) *guttifera* Parker and Jones. 1865. Phil. Trans. clv. 343. pl. xiii. fig. 11.
Dentalina soluta Hantken. 1875. Mitth. Jahrb. d. K. ung. geol. Anstalt. iv. 29. pl. ii. figs. 2, 14.
Nodosaria (*D.*) *soluta* Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 503. pl. lxii. figs. 13–16; pl. lxiv. fig. 28.

Test elongate, a little arcuate, with a few spherical chambers; with constricted interstices, first chamber somewhat mucronate, the last produced into a short siphon; aperture naked.

Locality. Timber Creek, in the yellow limestone. Rare. Teredo bed. Frequent.

Nodosaria vertebralis Batsch, sp.

Nautilus (*Orthoceras*) *vertebralis* Batsch. 1791. Conchyl. des Seesandes. 3. No. 6. pl. ii. fig. 6. a, b.

Nodosaria fascia Parker, Jones, and Brady. 1865. Ann. and Mag. Nat. Hist. ser. 3. xv. 227. No. vi.

Nodosaria vertebralis Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 514. pl. lxiii. fig. 35 ; pl. lxiv. figs. 11–14.

"The shell of *Nodosaria vertebralis* is long, slender, slightly tapering, and generally more or less curved ; the segments are very numerous and the septal lines straight; and the surface is marked by distinct, continuous, longitudinal striæ or riblets. The outline is even and the sutures are unconstricted ; the septa are conspicuously thick and formed of transparent shell substance, but not limbate externally."—Brady, loc. cit.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare. Timber Creek, teredo bed. Not abundant.

LINGULINA d'Orbigny.

Lingulina carinata d'Orbigny.

Lingulina carinata d'Orbigny. 1826. Ann. Sci. Nat. vii. 257. No. 1 ; Modèle. No. 26.

Lingulina carinata d'Orbigny. 1839. Foram. Canaries. 124. pl. i. figs. 5, 6.

Lingulina carinata Williamson. 1858. Rec. Foram. Gt. Br. 14. pl. ii. figs. 33–35.

Lingulina carinata Parker and Jones. 1860. Foram. Chellast. Quart. Journ. Geol. Soc. xvi. pl. xix. figs. 13, 14.

Frondicularia nysti Reuss. 1863. Crag. d'Anvers Bull. Acad. Belg. ser. 2. xv. 148. pl. ii. fig. 20.

Lingulina bursæformis Gümbel. 1868. Nordalp. Eocän. K. Bayr. Akad. Abhandl. I. x. 628. pl. i. fig. 51.

Lingulina pygmæa Reuss. 1873. Geinitz' Elbthalgeb. Sachsen. 2. 90. II. 20. fig. 23.

Lingulina glabra Hantken. 1875. Mitth. Jahrbuch. d. K. ungar. geol. Anstalt. iv. 42. pl. xiii. fig. 14.

Nodosarina carinata Goës. 1882. Kongl. Svenska Vet. Akad. xix. pl. i. figs. 65–67.

Lingulina carinata Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 517. pl. lxv. figs. 16, 17.

Test oblong-elongate, compressed, carinate, shining, smooth, translucent, anteriorly rotund, posteriorly cuneate, with numerous inequal chambers; aperture linear, transverse.

Locality. Timber Creek, teredo bed. Rare. Gryphæa bed. Rare.

FRONDICULARIA Defrance.

Frondicularia alata d'Orbigny.

"*Nautili caudiformes*" Soldani. 1798. Testaceographia. ii. 13. pl. i. fig. C.

Frondicularia alata d'Orbigny. 1826. Ann. Sci. Nat. vii. 256. No. 2.

Frondicularia alata Parker, Jones, and Brady. 1871. Ann. and Mag. Nat. Hist. ser. 4. viii. 161. pl. x. fig. 66.

Frondicularia alata, var. *sagittula* Vanden Broeck. 1876. Ann. Soc. Belg. Micr. ii. 113. pl. ii. figs. 12, 14.

Frondicularia alata, var. *lanceolata* Id. Ibid. 117. pl. ii. fig. 13.

Frondicularia complanata, var. *concinna* Id. Ibid. 109. pl. iii. fig. 2.

Frondicularia alata Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 522. pl. lxv. figs. 20–23; var. pl. lxvi. figs. 3–5.

"The figure in the Testaceographia, selected by d'Orbigny to bear the name *Frondicularia alata*, is that of a short complanate shell, which is very broad near the initial end, owing to the arms of the V-shaped segments reaching back nearly into a line with the primordial chamber. The free ends of the segments are irregular, and most of them projecting and pointed. The drawing is somewhat rough, but represents in their extreme development characters easily recognized in more typical specimens.

"Referring to the illustrations, the two large figures (figs. 20, 21) represent good examples of the species in the adult condition, the free ends of the chambers forming a nearly straight line, and one here and there extended into a projecting point. Such shells attain large dimensions, the length sometimes exceeding one-fifth inch (5 mm.). Vanden Broeck (*loc. cit.*) gives an ex-

cellent series of drawings, representing individual modifications of the species rather than distinct varieties."—Brady, loc. cit.

Locality. Stratton's marl pit, near Mullica Hill. Frequent. Timber Creek, teredo bed. Rare. Gryphæa bed. Rare. Yellow limestone. Rare.

Frondicularia angusta Nilsson, sp.

Planularia angusta Nilsson. 1827. Petrifacta Suecana. 11. pl. ix. fig. 22.

Frondicularia angustata Roemer. 1827. Petrifacta Suecana. 96.

Frondicularia angusta Reuss. 1844. Geog. Skizzen. aus Böh. ii. 211.

Frondicularia angusta Geinitz. 1844. Geog. Skizzen. aus Böh. ii. 70. pl. xvii. fig. 22.

Frondicularia angusta Reuss. 1845. Versteinerungen der böh. Kreid. 20. pl. viii. figs. 13, 14.

"Test 2–6''' elongate, small, lancet-shaped, at the lower end much elongated, above pointed, broadest at or above the centre. From the centre out to the marginal borders decreasing. Numerous (15–25) very small chambers, which are separated by proportionally broad roof-shaped sloping edges. These are interrupted in the centre by a longitudinal furrow which is smaller below, and moreover striated by more fine short lateral furrows, which nevertheless are not continued into the spaces between the edges. The lowest chamber very small, quite spherical, on every side provided with thin sharp longitudinal ribs and a short point on the base. The tolerably sharp lateral margin is continued over the first chamber to the end of the shell."—Reuss, loc. cit.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Quite rare. Bruere's pits, Crosswick's Creek, lower marl bed, above the gray layer. Rare. Timber Creek, in the teredo bed. Quite rare.

MARGINULINA d'Orbigny.

Marginulina costata Batsch, sp.

Nautilus (*Orthoceras*) *costatus* Batsch. 1791. Conchyl. des Seesandes. 2. pl. i. fig. 1. a–g.

"*Orthoceratia, Raphanus, Raphanistrum* et *Rapistrum*" Soldani.

1791. Testaceographia. i. pt. 2. 91. pl. xciv. figs. N, P, Q, R, X, Y.

Marginulina raphanus d'Orbigny. 1826. Ann. Sci. Nat. vii. 258. No. 1. pl. x. figs. 7, 8 ; Modèle. No. 6.

Marginulina interamniæ Costa. 1856. Atti dell' Accad. Pont. vii. 184. pl. xiii. fig. 9.

Marginulina obliquestriata Karrer. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 446. pl. i. fig. 8.

Marginulina striatocostata Reuss. 1862. Ibid. xlvi. 62. pl. vi. fig. 2.

Marginulina turgida Id. Ibid. 63. pl. vi. fig. 7.

Marginulina raphanus Parker, Jones, and Brady. 1865. Ann. Mag. Nat. Hist. ser. 3. xvi. 19. pl. i. fig. 35.

Marginulina hamus Terquem. 1866. Foram. du Lias. 6ième mém. 501. pl. xxi. fig. 8. a, b.

Marginulina radiata Id. Ibid. 505. pl. xxi. figs. 16, 17.

Marginulina, var. *crebicosta* Seguenza. 1880. Atti R. Accad. dei Lincei. ser. 3. vi. 90. pl. ix. fig. 6.

Marginulina costata Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 528. pl. lxv. figs. 10–13.

Test elongate, cylindrical, the chambers or members separated from each other like balls, but are connected by strong ribs, which unbrokenly extend over the entire shell and for the most part have a rectilinear back.

Locality. Timber Creek, teredo bed. Rare.

VAGINULINA d'Orbigny.

Vaginulina legumen Linné, sp.

Nautilus legumen Linné. 1758. Syst. Nat. 10th ed. 711. No. 248 ; 1767. 12th ed. 1164. No. 288.

Nautilus (*Orthoceras*) *leguminiformis* Batsch. 1791. Conchyl. des Seesandes. No. 8. pl. iii. fig. 8. a.

Vaginulina legumen d'Orbigny. 1826. Ann. Sci. Nat. vii. 257. No. 2.

Vaginulina lævigata Roemer. 1838. Neues. Jahrb. für Min. etc. 383. pl. iii. fig. 11.

Vaginulina elongata Roemer. 1840. Verst. Nordd. Kreid. 96. pl. xv. fig. 13.

Nodosaria legumen Reuss. 1845. Verst. böhm. Kreid. part 1. 28. pl. xiii. figs. 23, 24.

Dentalina legumen Williamson. 1858. Rect. Foram. Gt. Br. 21. pl. ii. fig. 45.

Vaginulina legumen Jones, Parker, and Brady. 1866. Monogr. Foram. Crag. 64. pl. iv. fig. 9.

Vaginulina legumen Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 530. pl. lxvi. figs. 13–15.

Test smooth, sometimes straight, often arcuate, and sometimes considerably so; slightly compressed laterally; consisting of a linear series of flat, smooth, oblique segments, rarely exceeding twelve in number. Primordial segment abruptly truncate; sometimes cuneiform; occasionally prolonged into a large, solid, transparent mucro. Peripheral outline entire, and not lobulated; though sometimes having the ultimate segment ventricose, and separated from the rest by a deeply constricted septal line. Septal lines smooth, oblique; tending backwards as they approach the convex margin of the shell. Septal aperture at the extremity of the ultimate segment, which extremity is not central, but at the concave margin; surrounded by a well-defined coronal.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare.

Vaginulina linearis Montagu, sp.

Nautilus linearis Montagu. 1808. Test. Brit. Suppl. 87. pl. xxx. fig. 9.

Marginulina vaginella Reuss. 1851. Zeitschr. d. deutsch. geol. Gesellsch. iii. 152. pl. viii. fig. 2.

Vaginulina striata Costa. 1856. Atti dell' Accad. Pont. vii. 182. pl. xvi. fig. 17.

Dentalina legumen, var. *linearis* Williamson. 1858. Rect. Foram. Gt. Br. 23. pl. ii. figs. 46–48.

Vaginulina lineâris Parker and Jones. 1865. Phil. Trans. clv. 343. xiii. figs. 12, 13.

Vaginulina linearis Jones, Parker, and Brady. 1866. Monograph of the Foram. of the Crag. 67. pl. i. figs. 10–12.

Vaginulina eocæna Gümbel. 1868. Abhand. d. K. bayer. Akad. d. Wiss, II. Cl. x. 632. pl. i. fig. 48. a, b.

Cristellaria dilute-striata Id. Ibid. 639. pl. i. fig. 69.
Vaginulina linearis Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 532. pl. lxvii. figs. 10–12.

Test straight or bent, more or less compressed ; chambers compactly set on, more or less oval in section ; ornamented in a variable degree with delicate parallel riblets, mostly oblique to axis of the shell ; aperture eccentric.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare. New Egypt, in the lower green marl. Fragments. Bruere's pits, Crosswick's Creek, lower marl bed, above the gray layers. Rare.

CRISTELLARIA Lamarck.

Cristellaria acutauricularis Fichtel and Moll, sp.

"*Hammoniæ subrotundæ*," etc. Soldani. 1789. Testaceographia. i. pt. 1. 61. pl. xlix. fig. x.
Nautilus acutauricularis Fichtel and Moll. 1803. Test. Micr. 102. pl. xviii. figs. g–i.
Cristellaria navicula d'Orbigny. 1840. Mém. Soc. géol. France. iv. 27. pl. ii. figs. 19, 20.
Cristellaria polita Reuss. 1855. Sitzungsb. d. K. Akad. Wiss. Wien. xviii. 237. pl. iii. fig. 41.
Robulina limbata (pars) Bornemann. 1855. Zeitschr. d. deutsch. geol. Gesellsch. vii. 335. pl. xv. figs. 4, 5.
Cristellaria acutauricularis Parker and Jones. 1860. Ann. and Mag. Nat. Hist. ser. 3. v. 114. No. 20.
Cristellaria acutauricularis Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 543. pl. cxiv. fig. 17. a, b.

Test spiral, involute, suboval, smooth, ventricose, exumbilicate, keel acute carinate ; convolutions with ten conspicuous subelevated joints ; dissepiments moderately convex in front, oval plane ovate-convex, marginate, with the exterior angle compressed, obtuse, subincurvate ; with orifice in the extremity of the said angle minutely rotund.

Locality. Timber Creek, in the gryphæa bed. Rare.

Cristellaria articulata Reuss.

Robulina articulata Reuss. 1863. Sitzungsb. d. K. Akad. Wiss. Wien. xlviii. 53. pl. v. fig. 62.

Cristellaria articulata Id. 1870. Ibid. lxii. 483 ; Schlicht. 1870. Foram. Pietzpuhl. pl. xvii. figs. 5–12.

Cristellaria articulata Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 547. lxix. figs. 10–12 ; wild-growing forms. figs. 1–4.

Test quite circular, slightly angular, compressed, in the centre slightly beaked, with six to eight curved chambers of which the last are moderately broadly triangular, considerably arched, separated by deep sutures, the septal walls of the last chamber oval, deeply outlined on the base, slightly convex.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Quite rare. Timber Creek, teredo bed. Rare.

Cristellaria crepidula Fichtel and Moll, sp.

Nautilus crepidula Fichtel and Moll. 1803. Test. Micr. 107. pl. xix. figs. g–i.

Cristellaria crepidula d'Orbigny. 1839. Foram. Cuba. 64. pl. viii. figs. 17, 18.

Cristellaria berthelotiana d'Orbigny. 1839. Foram. Canaries. 125. pl. i. figs. 14, 15.

Cristellaria intermedia Reuss. 1845. Verstein. böhm. Kreid. pt. i. 33, 108. pl. xiii. figs. 57, 58 ; pt. ii. pl. xxiv. figs. 50, 51.

Cristellaria cymboides d'Orbigny. 1846. Foram. Foss. Vien. 85. pl. iii. figs. 30, 31.

Cristellaria intermedia Alth. 1850. Haidinger's Naturw. Abhandl. iii. 267. pl. xiii. fig. 23.

Cristellaria jugleri Reuss. 1851. Zeitschr. d. deutsch. geol. Gesellsch. iii. 89. pl. iv. fig. 19. a, b.

Cristellaria subarcuatula Williamson. 1858. Rect. Foram. Gt. Br. 29. pl. ii. figs. 56, 57.

Cristellaria intermedia Reuss, var. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 328. pl. viii. fig. 2.

Cristellaria grata Reuss. 1862. Sitzungsb. d. K. Akad. Wiss. Wien. xlvi. 70. pl. vii. fig. 14.

Cristellaria planiuscula Id. Ibid. 71. pl. vii. fig. 15.
Cristellaria cordiformis Terquem. 1863. Foram. du Lias. 3ième mém. 203. pl. ix. fig. 14. a, b.
Cristellaria acuminata Id. Ibid. 210. pl. x. fig. 5. a, b.
Hemirobulina compressa Stache. 1864. Novara Exped. i. Paläont. 229. pl. xxiii. fig. 8. a, b.
Cristellaria crepidula Parker and Jones. 1865. Phil. Trans. clv. 344. pl. xiii. figs. 15, 16 ; pl. xvi. fig. 4.
Cristellaria kochi Reuss. 1866. Denkschr. d. K. Akad. Wiss. Wien. xxv. 139. pl. ii. fig. 35. a, b.
Cristellaria galeata Id. Ibid. 141. pl. iii. fig. 8. a, b.
Cristellaria crepidula Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 542. pl. lxvii. figs. 17, 19, 20; pl. lxviii. figs. 1, 2.

Test spiral subinvolute, elongate, slightly curved, smooth, pellucid, compressed, with subelevated sides, back obtuse, 12–13 conspicuous chambers, planate except the last which is more elevated ; chamber walls slightly convex anteriorly, radiating from a common centre with the last two or three, scarcely elevate plane-oval lanceolate convex ; orifice minute rotund slightly crenate on the outside of the angle.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare.

Cristellaria cultrata Montfort, sp.

"*Cornu Hammonis*" Plancus. 1760. Conch. Min. ed. altera-120. pl. i. fig. xii. sec. 552.
"*Nautili* (*Lenticulæ marginatæ*)" Soldani. 1789. Testaceographia. i. pt. 1. 54. pl. xxxiii. figs. B etc.
Robulus cultratus Montfort. 1808. Conchyl. Systèm. i. 214 54e genre.
Robulina cultrata d'Orbigny. 1826. Ann. Sci. Nat. vii. 287. No. 1 ; Modèle No. 82.
Robulina canariensis d'Orbigny. 1839. Foram. Canaries. 127. pl. iii. figs. 3, 4.
Robulina subcultrata d'Orbigny. 1839. Foram. Amér. Mérid. 26. pl. v. figs. 19, 20.
Robulina cultrata d'Orbigny. 1846. Foram. Foss. Vien. 96. pl. iv. figs. 10–13.

Robulina similis d'Orbigny. Ibid. 98. pl. iv. figs. 14, 15.
Cristellaria hoffmanni Ehrenberg. 1854. Mikrogeologie. pl. xxvi. fig. 53.
Robulina limbosa Reuss. 1863. Sitzungsb. d. K. Akad. Wiss. Wien. xlviii. 55. pl. vi. fig. 69.
Cristellaria gyroscalprum Stache. 1864. Novara Exped. geol. i. Paläont. 243. pl. xxiii. fig. 22. a, b.
Robulina cultrata, var. *antipodum* Id. Ibid. 251. pl. xxiii. fig. 30. a, b.
Robulina tœttovata Id. Ibid. 253. pl. xxiii. fig. 32. a, b.
Cristellaria cultrata Parker and Jones. 1865. Phil. Trans. clv. 344. pl. xiii. figs. 17, 18; pl. xvi. fig. 5.
Robulina curvispira Seguenza. 1879. Atti R. Accad. dei Lincei. ser. 3. vi. 144. pl. xiii. fig. 28.
Robulina stellata Id. Ibid. 144. pl. xiii. fig. 29.
Robulina dubia Id. Ibid. 144. pl. xiii. fig. 30.
Cristellaria cultrata Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 550. pl. lxx. figs. 4, 5, 6, 7, 8.
Cristellaria cultrata Whiteaves. 1887. Trans. Roy. Soc. Can. iv. 114.

Test orbicular-convex, smooth, or radiate, costate, carinate margin, lamellose; with eight oblique chambers, somewhat convex, smooth or costate, with the last excavated above, aperture radiate.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Common. Bruere's pit, Crosswick's Creek, lower marl bed above the gray layers. Not common. New Egypt, green marl. Fragments. Timber Creek, teredo bed. Common. Marlborough, green marl. Quite abundant.

Cristellaria gibba d'Orbigny.

Cristellaria gibbia d'Orbigny. 1839. Foram. Cuba. 63. pl. vii. figs. 20, 21.
Cristellaria excisa Bornemann. 1855. Zeitschr. d. deutsch. geol. Gesellsch. vii. 328. pl. xiii. figs. 19, 20.
Cristellaria nuda Reuss. 1861. Sitzungsb. d. K. Ak. Wiss. Wien. xliv. 328. pl. vi. figs. 1–3.
Cristellaria pulchella Id. 1862. Ibid. xlvi. 71. pl. viii. fig. 1.

Robulina concinna Id. 1863. Ibid. xlviii. 52. pl. v. fig. 58.
Cristellaria gibba Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 546. pl. lxix. figs. 8, 9.

Test oblong-convex, inflated, subcarinate, smooth, shining, yellowish ; ten elongate chambers, arcuate, terminal one subconcave above, margined, with sutures complanate, umbilicus impressed ; aperture marginate, radiate.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Quite rare. Timber Creek, teredo bed. Quite rare. Gryphæa bed. Rare.

Cristellaria italica Defrance, sp.

Saracenaria italica Defrance. 1824. Dict. Sci. Nat. xxxii. 177 ; xlvii. 344. Atlas Conch. pl. xiii. fig. 6.
Saracenaria italica Blainville. 1825. Man. de Malacol. 370. pl. v. fig. 6.
Cristellaria (*Saracenaria*) *italica* d'Orbigny. 1826. Ann. Sci. Nat. vii. 293. No. 26. Modèles Nos. 19 and 85.
Frondicularia triedra Costa. 1856. Atti dell' Accad. Pont. vii. 174. pl. xiii. figs. 26, 27.
Cristellaria italica Parker, Jones, and Brady. 1865. Ann. and Mag. Nat. Hist. ser. 3. xvi. 22, 32. pl. i. figs. 41, 42.
Cristellaria (*Marginulina*) *italica*, var. *cincta* Karrer. 1877. Geol. K. F.-J. Wasserleitung. 383. pl. xvi. b. fig. 38.
Cristellaria (*Marginulina*) *italica*, var. *aureola* Id. Ibid. 383. pl. xvi. b. fig. 39.
Cristellaria italica Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 544. pl. lxviii. figs. 17, 18, 20–23.

"*Saracenaria*. Shell almost microscopical, oval, celled, with a sort of sinuous keel in its middle, from which start oblique striæ, indications of interior partitions, not sinuous, which divide its cavity into two ranges of chambers ; no trace of an exterior opening."—D'Blainville. 370. pl. v. fig. 6.

"The test of *Cristellaria italica* is elongate and trihedral ; the planospiral segments are few and inconspicuous, whilst those of the body of the shell are superimposed so as to form a curved line. The convex or dorsal margin is sharp but not carinate, and the ventral face is so broad that the transverse section of the shell

has the form of a nearly equilateral triangle. The segments are short and obliquely set, dipping at the front more or less towards the initial end, as in *Vaginulina*."—Brady, loc. cit.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare.

This being such a peculiar species I have given the original generic description and specific characters given by my esteemed friend, H. B. Brady.

CRISTELLARIA ROTULATA Lamarck, sp.

'*Cornu Hammonis* seu *Nautili*" Plancus. 1739. Conch. Minn. 13. pl. i. fig. III.

Lenticulites rotulata Lamarck. 1804. Ann. du Muséum. v. 188. No. 3; Tableau Encycl. et Méth. pl. cccclxvi. fig. 5.

Robulina muensteri Roemer. 1841. Verstein. norddeutsch. Kreid. pt. 2. 98. pl. xv. fig. 30.

Cristellaria rotulata Forbes. 1845. Quart. Journ. Geol. Soc. i. 65, 66. fig.

Robulina simplex d'Orbigny. 1846. Foram. Foss. Vien. 102. pl. iv. figs. 27, 28.

Robulina stellifera Czjzek. 1847. Haidinger's Naturw. Abhandl. ii. 142. pl. xii. figs. 26, 27.

Robulina trigonostoma Reuss. 1851. Zeitschr. d. deutsch. geol. Gesellsch. iii. 69. pl. iv. fig. 26.

Robulina neglecta Id. Ibid. 69. pl. iv. fig. 27.

Robulina deformis (pars) Bornemann. 1855. Ibid. vii. 337. pl. xiv. fig. 1.

Robulina depauperata Id. Ibid. 337. pl. xiv. fig. 11.

Robulina incompta (?) Id. Ibid. 336. pl. xiv. fig. 12.

Cristellaria calcar (typica) Williamson. 1858. Rec. Foram. Gt. Br. 27. pl. ii. figs. 52, 53.

Cristellaria rotulata Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 326, 336.

Phonemus (*Cristellaria*) *rotulatus* (d'Orbigny ?) Meek. 1864. Smithsonian Inst. Mis. Coll. 177. i.

Cristellaria rotulata Parker and Jones. 1865. Phil. Trans. clv. 345. pl. xiii. fig. 19.

Cristellaria inornata Terquem. 1876. Anim. sur la Plage de Dunkerque. 70. pl. vii. fig. 18.

Cristellaria austriaca Id. Ibid. 70. pl. vii. fig. 20. a, b.
Cristellaria simplex Id. Ibid. 70. pl. vii. fig. 21. a, b.
Robulina simplicissima Seguenza. 1879. Atti R. Accad. dei Lincei. ser. 3. vi. 141. pl. xiii. fig. 18.
Robulina lucida Id. Ibid. 142. pl. xiii. fig. 19.
Cristellaria falcifer Stache. 1864. Novara Exped. geol. i. Paläont. 240. pl. xxiii. fig. 19 a, b.
Cristellaria rotulata Schlumberger. 1882. Journ. Cin. Soc. Nat. Hist. v. 119 pl. v. figs. 2, 2a.
Cristellaria rotulata Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 547. lxix. fig. 13. a, b.

Test orbiculate, convex, smooth, non-costate sutures forming a star in the plane centre, without central disc, margin narrowly carinate; nine triangular narrow complanate chambers; aperture radiate

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Very common. Timber Creek, in the yellow limestone. Abundant. Teredo bed. Not abundant.

Cristellaria wetherellii Jones, sp.

Marginulina sp. Sowerby. 1834. Trans. Geol. Soc. Lond. ser. 2. v. 135. pl. ix. fig. 12.
Marginulina wetherellii Jones. 1854. Morris's Cat. Brit. Foss. 37.
Marginulina wetherellii Parker and Jones. 1859. Ann. and Mag. Nat. Hist. ser. 3. iv. 350.
Marginulina fragaria Gümbel. 1868. Abhandl. d. K. bayer. Akad. d. Wiss. II. cl x. 635. pl. i. fig. 58. a, b, c.
Cristellaria asperula Id. Ibid. pl. i. fig. 65. a, b.
Cristellaria arcuata Hantken. 1875. Mittheil. Jahrb. d. K. ung. geol. Anstalt. iv. 51. pl. v. fig. 10.
Cristellaria fragaria Id Ibid. 53. pl. vi. figs. 1–3.
Cristellaria wetherellii Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 537. pl. cxiv. fig. 14.

"The test of *Cristellaria wetherellii* is usually pod-like or crosier-shaped, but varies greatly in length and in the relative development of the spiral and linear portions. It is, however, always more or less spiral at the commencement, and almost invariably exhibits considerable lateral compression; therefore, so

far as such characters are of any distinctive value, it belongs to the genus *Cristellaria* rather than to *Marginulina*. The salient feature of the species is its peculiar surface-decoration, consisting of closely-set raised tubercles, which take the place of continuous limbate septal lines. These are often, but not invariably, connected by slight, oblique, longitudinal costæ, most apparent on the earlier portions of the shell."—Brady, loc. cit.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Quite rare. Timber Creek, teredo bed. Abundant.

Sub-family POLYMORPHININÆ

POLYMORPHINA d'Orbigny.

Polymorphina angusta Egger.

Polymorphina (*Globulina*) *fusiformis* Roemer. 1838. Neues Jahrb. für Min. 386. pl. iii. fig. 37.

Polymorphina liassica Strickland. 1845. Quart. Journ. Geol. Soc. ii. 30. fig. b.

Globulina leopolitana Reuss. 1850. Haidinger's Abhandl. iv. 44. pl. v. fig. 11.

Grammostomum turis Ehrenberg. 1854. Mikrogeologie. pl. xxvi. fig. 19.

Globulina acuta Reuss. 1855. Sitzungsb. d. K. Akad. Wissensch. xviii. 51. pl. vi. fig. 62.

Polymorphina (*Globulina*) *angusta* Egger. 1857. Neues Jahrb. für Min. 290. pl. xiii. figs. 13, 15.

Polymorphina subrhombica Reuss. 1861. Sitzungsb. d K. Akad. Wiss. Wien. xliv. 339. pl. vii. fig. 3

Polymorphina lanceolata (pars) Reuss. 1870. Sitzungsb. d. K. Akad. Wiss. Wien. lxii. 487. No. 12; Schlicht. 1870. Foram. Pietzpuhl. pl. xxxi. figs. 2, 3, 4.

Polymorphina gracilis Id. Ibid. Schlicht. 1870. Foram. Pietzpuhl. 486. No. 7. pl. xxxi. figs. 34, 45.

Polymorphina fusiformis (pars) Brady, Parker, and Jones. 1870. Trans. Linn. Soc Lond. xxvii. 219. pl. xxxix. fig. 5. a, b, c.

Polymorphina angusta Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 563. pl. lxxi. figs. 1–3.

Test elongate, subcylindrical, tapering at both extremities.

Chambers few, from three to four, oblique, somewhat convex, septal lines but slightly depressed. Surface smooth.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare.

Polymorphina communis d'Orbigny.

Polymorphina (*Guttulina*) *communis* d'Orbigny. 1826. Ann. Sci. Nat. vii. 226. No. 15. pl. 12. figs. 1–4; Modèle No. 62.

Guttulina vitrea d'Orbigny. 1839. Foram. Cuba. 128. pl. ii. figs. 1–3

Polymorphina (*Guttulina*) *communis* Roemer. 1838. Neues Jahrb. für Min. Jahr. 1838. 385. pl. iii. fig. 29.

Polymorphina glomerata Roemer. 1841. Verstein. norddeutsch. Kreid. pt. 2. 19. pl. xv. fig. 19.

Polymorphina glomerata Reuss. 1845. Verstein. böhm. Kreid. pt. 1. 40. pl. xii. fig. 32.

Guttulina communis Reuss. 1845. In Geinitz's Grundriss der Verstein. 669. pl. xxiv. fig. 82.

Guttulina communis d'Orbigny. 1846. Foram. Foss. Vien. 224. pl. xiii. figs. 6–8.

Guttulina irregularis d'Orbigny. Id. Ibid. 226. pl. xiii. figs. 9, 10.

Globulina discreta Reuss. 1849. Denkschr. Mathem-Natur. Cl. K. Akad. Wissensch. i. 378. pl. xlviii. fig. 10.

Guttulina cretacea Alth. 1849. Haidinger's Abhandl. iii. 262. pl. xiii. fig. 14.

Guttulina semiplana Reuss. 1851. Deutsch. d. geol. Gesell. iii. 82. pl. vi. fig. 48

Guttulina semiplana Bornemann. 1855. Zeitsch. deutsch. geol. Gesell. vii. 344.

Polymorphina (*Guttulina*) *communis* Egger. 1857. Neues Jahrb. für Min. Jahr. 1857. 288. pl. xiii. figs. 16–18.

Polymorphina (*Guttulina*) *lata* Egger. Ibid. 228. pl. xiii. figs. 22–24.

Guttalina fissurata Stache. 1865. Novara Exped. Geol. i. pt. 2. 263. pl. xxiv. fig. 10.

Guttalina obliquata Id. Ibid. 264. pl. xxiv. fig. 11.

Polymorphina problema, var. *deltoidea* Reuss. 1866. Denkschr. d. mathem. Natur. Cl. Akad. Wiss. xxv. 154. pl. iv. fig. 8.

Polymorphina semiplana Reuss. 1870. Sitzungsb. d. K. Akad. Wiss. Wien. lxii. 488 No. 16 ; Schlicht. 1870. Foram. Pietzpuhl. pl. xxvii. figs. 22–33.

Polymorphina problema, var *communis* Id. Ibid. 487. No. 15 ; Schlicht. pl. xxx. figs. 13–16.

Polymorphina communis Brady, Parker, and Jones. 1870. Trans. Linn. Soc. Lond. xxvii. 224. pl. xxxix. fig. 10. a, b.

Polymorphina communis Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 568. pl. lxxii. fig. 19.

Test ovate, gibbous, more or less compressed at three sides ; anterior extremity acute ; posterior obtuse and rounded. Chambers few, oblique, inflated. Sutures depressed. Surface smooth. Aperture circular, coronate.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare. Timber Creek, in the yellow limestone. Rare. Teredo bed. Abundant. In the gryphæa bed. Rare.

Polymorphina compressa d'Orbigny.

Fistulose form.

Polymorpha corcula spinosa Soldani. 1791. Testaceographia ac Zoophytographia. i. pt. 2. pls. 109–111.

Guttulina damæcornis Reuss. 1845. Verst. böhm. Kreid. 1te Abtheil. 40. pl. xiii. fig. 85.

Guttulina tubulosa d'Orbigny. 1846. Foram. Foss. Vien. 228. pl. xiii figs. 15, 16.

Aulostomella pediculus Alth. 1849. Haidinger's Naturw. Abhandl. iii. 264. pl. xiii. fig. 17.

Globulina horrida Reuss. 1850. Ibid. iv. 43. pl. iv. fig. 8.

Polymorphina fistulosa Williamson. 1858. Rec. Foram. Gt. Brit. 72. pl. vi. fig. 150.

Polymorphina lactea, var. *tubulosa* Parker and Jones. 1865. Phil. Trans. Roy. Soc. clv. 362. pl. xiii. fig. 52. a–d.

Polymorphina orbignii (pars) Brady, Parker, and Jones. 1870. Trans. Linn. Soc. Lond. xxvii. 244. pl. xlii. fig. 38. d.

Polymorphina compressa (Fistulose form) Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 566. pl. lxxiii. fig. 17.

Polymorphina compressa Whiteaves. 1887. Trans. Roy. Soc. Can. iv. 114.

Test free or adherent. General form variable; oval, oblong, or compressed. Terminal segments developing numerous irregular expansions and tubular outgrowths.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare. Timber Creek, in the yellow limestone. Quite rare.

POLYMORPHINA LACTEA Walker and Jacob, sp.

"Serpula tenuis ovalis lævis" Walker and Boys. 1784. Test. Min. 2. pl. i. fig. 5.

Serpula lactea Walker and Jacob. 1798 (fide Kanmacher). Adams' Essays. 2d ed. 634. pl. xxiv. fig. 4.

Vermiculum lacteum Montagu. 1803. Test. Brit. 522.

Guttulina plancii d'Orbigny. 1839. Voyage dans l'Amér. Mérid. 60. pl. i. fig. 5.

Polymorphina lactea Macgillivray. 1843. Moll. Aberd. 320.

Arethusa lactea Thorpe. 1844. Brit. Mar. Conch. 233.

Globulina lachryma Reuss. 1845. Verstein. böhm. Kreid. pt. 1. 40, 110. pl. xiii. fig. 83; Alth. 1849. Haidinger's Abhandl. iii. 263. pl. xiii. fig. 16; Reuss. 1850. Ibid. iv. 43. pl. v. fig. 9.

Pyrulina ovulum Ehrenberg. 1854. Mikrogeologie. pl. xxxi. figs. 35, 36.

Polymorphina muensteri Reuss. 1855. Sitzungsb. d. K. Akad. Wiss. Wien. xviii. 249. pl. viii. fig. 80.

Globulina roemeri Id. Ibid. 245. pl. vi. fig. 63.

Polymorphina lactea, typica (pars) Williamson. 1858. Rec. Foram. Gt. Brit. 71. pl. vi. fig. 147.

Polymorphina lactea, var. *communis* Id. Ibid. 72. pl. vi. figs. 153–155.

Polymorphina lactea Dawson. 1859. Can. Nat. and Geologist. iv. 28. figs. 2, 3.

Guttulina diluta Bornemann. 1860. Zeitschr. deutsch. geol. Gesellsch xii. 160. pl. vi. fig. 11.

Globulina lacrima Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 318, 338.

Polymorphina lactea Brady, Parker, and Jones. 1870. (Mono-

graph of *Polymorphina*) Trans. Linn. Soc. Lond. xxvii. 213. pl. xxxix. fig. 1. a–c.

Polymorphina lactea Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 559. pl. lxxi. (typical) fig. 11 ; (var.) fig. 14.

Polymorphina lactea Whiteaves. 1887. Trans. Roy. Soc. Can. iv. 114.

Fistulose form.

"*Polymorpha corcula spinosa*" Soldani. 1791. Testaceographia. i. pt. 2. 114. pl. cix. fig. I, etc.

Misilus aquatifer Montfort. 1808. Conch. Systém. i. 294. 74^{e} genre.

Apiopterina d'Orbigni Zborzewski. 1834. Nouv. Mém. Soc. Imp. Nat. Moscou. iii. 311. pl. xxviii. fig. 2. b.

Polomorphina lactea (fistulose form) Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 560. pl. lxxiii. fig. 14.

Test ovate, gibbous, slightly unsymmetrical ; anterior extremity acute ; posterior obtuse, rounded. Chambers few, oblong, oblique, somewhat inflated. Sutures depressed. Surface smooth. Aperture simple, circular or oval, radiate.

Locality. Timber Creek, in the yellow limestone. Rare. Teredo bed. Quite abundant.

The fistulose forms are those having a hollow, like a pipe or reed. They are occasionally found in the teredo bed.

Polymorphina oblonga d'Orbigny.

Polymorphina oblonga d'Orbigny. 1846. Foram. Foss. Vien. 232. pl. xxii. figs. 29–31.

Polymorphina uvæformis Reuss. 1855. Zeitschr. d. deutsch. geol. Gesellsch. vii. 289. fig. 5.

Polymorphina guttata Reuss. 1870. Sitzungsb. d. K. Akad. Wiss. Wien. lxii. 487 ; Schlicht. 1870. Foram. Pietzpuhl. pl. xxx. figs. 25–32.

Polymorphina oblonga Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 569. pl. lxxiii. figs. 2–4.

Test elongate, smooth, anteriorly acuminate, posteriorly obtuse, compressed ; with six oblong chambers, convex ; sutures excavate, aperture radiate.

Locality. Timber Creek, in the teredo bed. Rare.

Polymorphina problema d'Orbigny.

Polymorphina (*Guttulina*) *problema* d'Orbigny. 1826. Ann. Sci. Nat. vii. 266. No. 14; Modèle No. 61.

Polymorphina (*Guttulina*) *crassatina* Münster. 1838 (fide Roemer). Neues Jahrb. für Min. Jahr. 1838. 385. pl. iii. fig. 30.

Polymorphina (*Guttulina*) *spicæformis* Roemer. 1838. Ibid. 386. pl. iii. fig. 31.

Guttulina problema Reuss. 1845. In Geinitz's Grundriss der Verstein. 669. pl. xxiv. fig. 83.

Guttulina problema d'Orbigny. 1846. Foram. Foss. Vien. 224. pl. xii. figs. 26–28.

Guttulina austriaca Id. Ibid. 223. pl. xii. figs. 23–25.

Guttulina cretacea Alth. 1849. Haidinger's Naturw. Abhandl. iii. 262. pl. xiii. fig. 14.

Polymorphina uvula Ehrenberg. 1854. Mikrogeologie. pl. xxvi. fig. 28.

Polymorphina uvula Egger. 1857. Neues Jahrb. für Min. Jahr. 1857. 285. pl. x. figs. 26–29.

Guttulina cretacea Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 319, 339.

Guttulina rotundata Reuss. 1864. Sitzungsb. d. K. Akad. Wiss. Wien. l. 469. pl. iii. fig. 4.

Guttulina pusilla Stache. 1865. Novara Exped. Geol. i. pt. 2. 265. pl. xxiv. fig. 12.

Polymorphina problema Parker, Jones, and Brady. 1866. Monogr. Crag Foram. pl. i. fig. 64.

Polymorphina problema Brady, Parker, and Jones. 1870. Trans. Linn. Soc. Lond. xxvii. 225. pl. xxxix. fig. 11. a, b.

Polymorphina problema Brady. 1884. Report Foram. H. M. S. Challenger. Zool. ix. 568. pl. lxxii. fig. 20; pl. lxxiii. fig. 1.

Test oblong, ovate, irregular. Chambers numerous, much inflated, and separated by deep sutures; sometimes arranged triserially, but more frequently crowded together irregularly; orifice round, radiate; surface smooth.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare. Timber Creek, in the teredo bed. Abundant.

Polymorphina regularis von Münster.

Polymorphina regularis von Münster. 1838 (fide Roemer). Neues Jahrb. für Min. Jahr. 1838. 385. pl. 3. fig. 21.

Polymorphina regularis Philippi. 1844. Beiträge zur Kenntniss d. Tertiärverst. nordwest. Deutsch. 41, 70.

Polymorphina regularis Karsten. 1849. Verzeichn. d. Rostock. Verst. a. d. Sternberger Gestein. 8.

Polymorphina regularis Reuss. 1855. Sitzungsb. d. K. Akad. Wiss. Wien. xviii. 247. pl. vii. figs. 70–73; l. 38. pl. iii. figs. 11, 12. pl. iv. fig. i.

Polymorphina regularis, var. *Nysti* Reuss. 1863. Bullet. de l'Acad. roy. de Belgique. xv. 162. pl. iii. fig. 42.

Polymorphina lingulata Stache. 1865. Novara Reise i. 2 Abtheil. Paläont. von Neu-Seeland. 255. pl. 24. fig. i.

Polymorphina marsupium Stache. 1865. Novara Reise. i. 2te Abtheil. Paläont. von Neu-Seeland. 258. pl. xxiv. fig. 5.

Polymorphina dispar Stache. 1865. Novara Reise. i. 2te Abtheil. Paläont. von Neu-Seeland. 261. pl. xxiv. fig. 8.

Polymorphina gigantea Stache. 1865. Novara Reise. i. 2te Abtheil. Paläont. von Neu-Seeland. 262. pl. xxiv. fig. 9.

Polymorphina regularis Brady, Parker, and Jones. 1870. Trans. Linn. Soc. Lond. xxvii. 229. pl. xl. fig. 13. a–c.

Test oblong, irregularly biconvex, broadest in the upper half, tapering towards both base and apex; periphery thin and produced but not carinate. Septal lines marked by slight constriction. Chambers numerous, long, oblique. Surface smooth.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Common. Timber Creek, in the teredo bed. Not common.

Polymorphina rotundata Bornemann, sp.

Guttulina rotundata Bornemann. 1855. Zeitschr. d. deutsch. geol. Gesellsch. vii. 346. pl. xi. p. xviii. fig. 3.

Guttulina incurva Id. Ibid. 345. pl. xvii. fig. 6.

Guttulina fracta Id. Ibid. 344. pl. xvii. fig. 4.

Guttulina dimorpha Id. Ibid. 345. pl. xvii. fig. 5.

Polymorphina rotunda Reuss. 1866. Denkschr. mathem. Naturw. Cl. K. Akad. Wissensch. xxv. 153.

Polymorphina tenera Karrer. 1868. Sitzungsb. d. K. Akad. Wiss. Wien. lviii. 174. pl. iv. fig. 9.

Rostrolina sp. Schlicht. 1870. Foram. Pietzpuhl. 72. No. 412. pl. xxvi. figs. 13–15.

Polymorphina rotunda Reuss. 1870. Sitzungsb. d. K. Akad. Wiss. Wien. lxii. 487. No. 14; Schlicht. op. cit. pl. xxvi. figs. 13–15; pl. xxviii. figs. 1–5; pl. xxx. figs. 33–40.

Polymorphina turgida Id. Ibid. 487. No. 10; Schlicht. pl. xxviii. figs. 6–10; pl. xxix. figs. 1–5.

Polymorphina rotundata Brady, Parker, and Jones. 1870. Trans. Linn. Soc. Lond. xxvii. 234. pl. xl. fig. 19. a–e, and woodcuts.

Polymorphina rotundata Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 570. pl. lxxiii. figs. 5–8.

Test oblong, ovoid, subcylindrical, gibbous, rounded at the base, more or less produced at the apex. Chambers numerous, broad. Septa marked by lines only, neither constricted nor excavated. Orifice simple, round, oval, or radiate. Surface smooth.

Locality. Timber Creek, in the teredo bed. Rare.

GLOBIGERINIDÆ.

GLOBIGERINA d'Orbigny.

Globigerina cretacea d'Orbigny.

Globigerina cretacea d'Orbigny. 1840. Mém. Soc. Geol. France. iv. 34. pl. iii. figs. 12–14.

Globigerina foveolata (pars) Ehrenberg. 1854. Mikrogeologie. pl. xxiv. fig. 49.

Globigerina libani Ehrenberg. Ibid. pl. xxv. fig. 30.

Planulina pachyderma Id. Ibid. pl. xxv. fig. 31.

Rotalia pertusa Id. Ibid. pl. xxiv. fig. 41.

Rotalia aspera Id. Ibid. pl. xxvii. figs. 57, 58; pl. xxviii. fig. 42; pl. xxxi. fig. 44.

Rotalia globulosa Id. Ibid. pl. xxvii. fig. 60; pl. xxviii. figs. 40, 41; pl. xxxi. figs. 40, 41, 43.

Rotalia densa Id. Ibid. pl. xxvii. fig. 62.

Rotalia quaterna Id. Ibid. pl. xxvii. fig. 53; pl. xxviii. fig. 34.

Rotalia rosa Id. Ibid. pl. xxvii. fig. 54.
Rotalia pachyomphala Id. Ibid. pl. xxvii. fig. 55.
Rotalia tracheotetras Id. Ibid. pl. xxvii. fig. 35.
Rotalia perforata Id. Ibid. pl. xxviii. fig. 36; pl. xxix. fig. 2.
Rotalia protacmæa Id. Ibid. pl. xxviii. fig. 37.
Rotalia laxa Id. Ibid. pl. xxviii. fig. 38; pl. xxix. fig. 1; pl. xxxi. fig. 42.
Rotalia centralis Id. Ibid. pl. xxviii. fig. 39.
Globigerina cretacea G. M. Dawson. 1875. Report Geol. and Resources, 49th Parallel British N. A. Boundary Comm. 79.
Globigerina cretacea Brady. 1879. Quart. Journ. Micr. Sci. xix. n. s. 285.
Globigerina cretacea Schwager. 1883. Palæontographica. xli. fig. 13. a–d.
Globigerina cretacea Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 596. pl. lxxxiii. Fossil specimens. fig. 11. a–c.
Globigerina cretacea Woodward and Thomas. 1885. 13th Ann. Report. Geol. Nat. Hist. Survey Minn. 171. pl. iii. figs. 14–16; ii. fig. 19.
Globigerina cretacea Tyrrell. 1890. Trans. Roy. Soc. Can. vii. 114.
Globigerina cretacea Woodward and Thomas. 1893. Final Report Geol. Nat. Hist. Survey Minn. iii. 41. pl. D. figs. 18, 19.

Test suborbicular, compressed, rugose aculeate, spire obtuse, with three distinct convolutions, five to seven segments, depressed spheroidal, sutures excavated, aperture large in the umbilicus.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Common. Timber Creek, in the yellow limestone. Rare. Teredo bed. Common.

ROTALIDÆ.

DISCORBINA Parker and Jones.

Discorbina bertheloti d'Orbigny, sp.

Rosalina bertheloti d'Orbigny, 1839. Foram. Canaries. 135. pl. i. figs. 28–30.

Discorbina bertheloti Brady. 1864. Trans. Linn. Soc. Lond. xxiv. 469. pl. xlviii. fig. 10. a, b.

Discorbina turbo, var. *parisiensis*, subvar. *berthelotiana* Parker and Jones. 1865. Phil. Trans. clv. 387. pl. xvi. figs. 26, 27.

Discorbina berthelotiana Goës. 1882. Kongl. Sv. Vet. Akad. xix. 107. pl. viii. figs. 266–268.

Discorbina bertheloti Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 650. pl. lxxxix. figs. 10–12.

Discorbina bertheloti Woodward. 1887. Journ. N. Y. Mic. Soc. iii. 17.

Test very depressed, carinate, punctate; spire short, with two convolutions, partly with depressed chambers, carinate, arcuate, margin limbate.

Locality. Timber Creek, in the yellow limestone. Quite rare. Teredo bed. Rare.

TRUNCATULINA d'Orbigny.

Truncatulina haidingerii d'Orbigny, sp.

Rotalina haidingerii d'Orbigny. 1846. Foram. Foss. Vien. 154. pl. vii. figs. 7–9.

Rotalina ehrenbergii Bailey. 1851. Smithsonian Contrib. ii. art. 3. 10. figs. 11–13.

Rotalia brueckneri Reuss. 1855. Zeitschr. d. deutsch. geol. Gesellsch. vii. 273. pl. ix. fig. 7.

Rotalia propinqua Reuss. 1855. Sitzungsb. d. K. Akad. Wiss. Wien. xviii. 241. pl. iv. fig. 53. a, b, c.

Rotalia hemisphærica Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 314. pl. ii. fig. 5.

Rotalia lenticula Reuss. 1863. Sitzungsb. d. K. Akad. Wiss. Wien. xlvi. 35. pl. x. fig. 3.

Planorbulina haidingeri Brady. 1864. Trans. Linn. Soc. Lond. xxiv. 469. pl. xlviii. fig. 11.

Planorbulina farcta var. *haidingerii* Parker and Jones. 1865. Phil. Trans. clv. 382. pl. xvi. fig. 22. a, b.

Truncatulina haidingeri Reuss. 1867. Sitzungsb. d. K. Akad. Wiss. Wien. lv. 28.

Pulvinulina haidingeri Hantken. 1875. Mittheil. Jahrbuch. d. Kön. ungar. geol. Anstalt. iv. 77. pl. xv. fig. 10. a, b.

Truncatulina haidingerii Brady. 1884. Report on Foram. H. M. S. Challenger, Zool. ix. 663. pl. xcv. fig. 7. a–c.

Test orbicular, trochiform, punctate, below somewhat convex, umbilicate, spire conical; with four narrow convolutions, externally carinate, with six chambers arcuate above, below narrowly triangular, convex.

Locality. Timber Creek, in the yellow limestone. Rare.

TRUNCATULINA LOBATULA Walker and Jacob, sp.

"*Nautilus spiralis lobatus*, etc." Walker and Boys. 1784. Test. Min. 20. pl. iii. fig. 71.

" *Hammoniæ tuberculatæ*, etc." Soldani. 1789. Testaceographia. i. pt. 1. 58. pl. xlv. figs. ii. kk, ll, mm.

Nautilus lobatulus Walker and Jacob. 1798. Adam's Essays, Kammacher's Ed. 642. pl. xiv. fig. 36.

Serpula lobatula Montagu. 1803. Test. Brit. 515. Suppl. 160.

Truncatulina tuberculata d'Orbigny. 1826. Ann. Sci. Nat. vii. 279. No. 1; Modèle No. 37.

Truncatulina lobatula d'Orbigny. 1839. Foram. Canaries. 134. pl. ii. figs. 22–24.

Discorbis lobatulus Macgillivray. 1843. Moll. Anim. Aberd. 34.

Truncatulina lobatula d'Orbigny. 1846. Foram. Foss. Vien. 168. pl. ix. figs. 18–23.

Truncatulina boveana d'Orbigny. 1846. Foram. Foss. Vien. 169. pl. ix. figs. 24–26.

Anomalina variolaria d'Orbigny. 1846. Foram. Foss. Vien. 170. pl. ix. figs. 27–29.

Truncatulina communis Reuss. 1855. Sitzungsb. d. K. Akad. Wiss. Wien. xviii. 242. pl. v. fig. 56.

Truncatulina lobatula Parker and Jones. 1857. Ann. and Mag. Nat. Hist. ser. 2. xix. 293. pl. x. figs. 17–21.

Truncatulina lobatula Williamson. 1858. Rec. Foram. Gt. Br. 59. pl. v. figs. 121–123.

Truncatulina varians Reuss. 1860. Sitzungsb. d. K. Akad. Wiss. Wien. xlii. 359. pl. ii. fig. 12. a, b.

Truncatulina lobatula Dawson. 1860. Can. Nat. and Geologist. v. 192. fig. 50.

Rotalia polyraphes Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 337.

Rosalina bosqueti Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 337. pl. iii. fig. 1.

Truncatulina dekayi Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 338. pl. vii. fig. 6. a, b, c.

Planorbulina farcta, var. (*Truncatulina*) *lobatula* Parker and Jones. 1865. Phil. Trans. clv. 381. pl. xiv. figs. 3–6 ; pl. xvi. figs. 18–20.

Truncatulina lobatula Jones, Parker, and Brady. 1866. Monogr. Foram. Crag. pl. ii. figs. 4–10 ; pl. iv. fig. 18.

Truncatulina (*lobulata ? d'Orb.*) Hilgard and Hopkins. 1878. Reclamation of the Alluvial Basin of the Miss. River. 43. pl. ii. fig. 65.

Truncatulina lobatula Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 660. pl. xcii. fig. 10 ; pl. xciii. figs. 1, 4, 5 ; pl. cxv. figs. 4, 5.

Truncatulina lobatula Whiteaves. 1887. Trans. Roy. Soc. Can. iv. 115.

Test suborbiculate, depressed, slightly punctate, beneath somewhat convex ; with three convolutions, externally angular ; with seven chambers, arcuate above, irregular somewhat convex.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare. Timber Creek, in the yellow limestone. Common. Teredo bed. Common. New Egypt, in the green marl. Rare.

Truncatulina ungeriana d'Orbigny, sp.

Rotalina ungeriana d'Orbigny. 1846. Foram. Foss. Vien. 157. pl. viii. figs. 16–18.

Rotalina granosa Reuss. 1851. Zeitschr. d. deutsch. geol. Gesellsch. iii. 75. pl. v. fig. 36.

Rotalina semipunctata Bailey. 1851. Smithsonian Contrib. ii. art. 3. 11. figs. 17–19.

Rotalia roemeri Reuss. 1855. Sitzungsb. d. K. Akad. Wiss. Wien. xviii. 240. pl. iv. fig. 52.

Rotalia mortoni Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 337. pl. viii. fig. 1.

Planorbulina ungeriana Brady. 1864. Trans. Linn. Soc. Lond, xxiv. 469. pl. xlviii. fig. 12,

Planorbulina farcta, var. *ungeriana* Parker and Jones. 1865. Phil. Trans. clv. 382. pl. xvi. figs. 23–25.

Truncatulina ungeriana Reuss. 1866. Denkschr. d. K. Akad. Wiss. Wien. xxv. 161. No. 10.

Truncatulina ungeriana Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 664. pl. xciv. fig. 9. a, b, c.

Test orbicular, depressed, punctate, below somewhat convex, umbilicate, spire complanate, granulose, with three wide convolutions, externally acutely carinate ; with eleven chambers, above triangular, below flexuose, somewhat convex, externally margined (limbate), the last convex.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare. Timber Creek, in the yellow limestone and the teredo bed. Rare.

ANOMALINA d'Orbigny.

Anomalina ammonoides Reuss, sp.

Rosalina ammonoides Reuss. 1845. Verstein. böhm. Kreid. pt. 1.36. pl. xiii. fig. 66; pl. viii. fig. 53.

Rosalina ammonoides Reuss. 1850. Haidinger's Naturw. Abhandl. iv. 36. pl. iv. fig. 2.

Rotalia ammonoides Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 337.

Nonionina bathyomphala Reuss. 1862. Sitzungsb. d. K. Akad. Wiss. Wien. xlvi. 95. pl. xiii. fig. 1. a, b.

Rosalina weinkauffi Reuss. 1863. Sitzungsb. d K. Akad. Wiss. Wien. xlviii. 68. pl. viii. fig. 97.

Rosalina maorica Stache. 1864. Novara Exped. geol. i. 282. pl. xxiv. fig. 32.

Rosalina orbiculus Stache. 1864. Novara Exped. geol. i. 285. pl. xxiv. fig. 34.

Planorbulina ammonoides Parker and Jones. 1865. Phil. Trans. clv. 379.

Rotalia capitata Gümbel. 1868. Abhandl. d. K. bayer. Akad. Wiss. II. cl. x. 653. pl. ii. fig. 92.

Rotalia ammonoides Reuss. 1870. Sitzungsb. d. K. bayer. Akad. Wiss. 283.

Planorbulina (*Anomalina*) *ammonoides* Jones and Parker. 1872. Quart. Journ. Geol. Soc. xxviii. 106; table 109.

Planorbulina ammonoides Reuss. 1874. Das Elbthalgebirge in Sachsen. ii. 114. pl. xxiii. fig. 9.

Anomalina ammonoides Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 672. pl. xciv. figs. 2, 3.

Anomalina ammonoides Tyrrell. 1890. Trans. Roy. Soc. Can. vii. 114.

Anomalina ammonoides Woodward and Thomas. 1893. Final Report Geol. Nat. Hist. Survey Minn. iii. 44. pl. D. figs. 28, 29, 30.

"The nautiloid aspect of the test is perhaps a more constant and more noticeable feature of *Anomalina ammonoides* than of any other member of the group. The shell is generally much compressed, and nearly equally convex on the two sides; the peripheral edge is round, and the aperture is placed almost symmetrically in the median line. In certain characters, however, the species betrays a tendency to variation. Some specimens are depressed at both umbilici (fig. 3), others are umbonate at one or both (fig. 2); sometimes the earlier convolutions are visible to a nearly equal extent on both faces; sometimes, on the other hand, they are nearly involute on the inferior side, though the shell retains its bilateral symmetry, as in Reuss's figure. The coarse perforation of the shell-wall is usually more conspicuous on the inferior than on the superior face."—Brady, loc. cit.

Locality. Bruere's pits, Crosswick's Creek, lower marl bed, in the gray marl. Rare. Timber Creek, in the teredo bed. Quite abundant.

PULVINULINA Parker and Jones.

Pulvinulina micheliniana d'Orbigny.

Rotalina truncatulinoides d'Orbigny. 1839. Foram. Canaries. 132. pl. ii. figs. 25–27.

Rotalina micheliniana d'Orbigny. 1840. Mém. Soc. géol. France. iv. 31. pl. iii. figs. 1–3.

Rotalina nitida Reuss. 1845. Böhm. Kreide. i. 35. pl. xii. figs. 8, 20, 31; pl. viii. fig. 52.

Rotalia micheliniana Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 336.

Discorbina micheliniana Reuss. 1865. Sitzungsb. d. K. Akad. Wiss. Wien. liii. 455. No. 1.

Pulvinulina repanda, var. *menardii*, sub var. *micheliniana* Parker and Jones. 1865. Phil. Trans. clv. 396. pl. xiv. fig. 16; pl. xvi. figs. 41–43.

Pulvinulina micheliniana Owen. 1867. Journ. Linn. Soc. Lond. ix. Zool. 148. pl. v. fig. 17.

Pulvinulina normanni Karrer. 1878. For. Luzon. Bolet. Comis. Mapa geol. d. Españo. 7. 2, 24. pl. F. fig. 10.

Pulvinulina micheliniana Brady. 1879. Quart. Journ. Micr. Sci. xix. n. s. 80.

Pulvinulina micheliniana Goës. 1882. Köngl. Sv. Vet. Akad. xix. 114. pl. viii. figs. 296–298.

Pulvinulina micheliniana Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 694. pl. civ. figs. 1, 2.

Test orbicular convex, smooth, above plane, beneath convex-conical, margin carinate, spire complanate, with three convolutions, feebly distinct; with angular chambers, subcomplanate, umbilicus convex, aperture elongate.

Locality. Timber Creek, in the yellow limestone. Rare.

Pulvinulina karsteni Reuss, sp.

Rotalia karsteni Reuss. 1855. Zeitschr. d. deutsch. geol. Gesellsch. vii. 273. pl. ix. fig. 6.

Rotalia karsteni Reuss. 1861. Sitzungsb. xliv. 337.

Pulvinulina karsteni Brady. 1864. Trans. Linn. Soc. Lond. xxiv. 470. pl. xlviii. fig. 15.

Pulvinulina repanda, var. *karsteni* Parker and Jones. 1865. Phil. Trans. clv. 396. pl. xiv. figs. 14, 15, 17; pl. xvi. figs. 38–40.

Pulvinulina karsteni Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 698. pl. cv. figs. 8, 9.

Pulvinulina karsteni Whiteaves. 1887. Trans. Roy. Soc. Can. iv. 115.

"The test of *Pulvinulina karsteni*, in well-developed specimens, is nearly round and very regularly built, convex on both faces, and with obtuse subangular periphery. It is composed of from three to four convolutions, the final circuit having about seven chambers; the sutures, which are marked by fine lines on

the superior face, are somewhat depressed on the inferior ; and the margin of the test on the inferior side has a limbate border." —Brady, loc. cit.

Locality. Timber Creek, in the yellow limestone. Common. Teredo bed. Not common.

ROTALIA Lamarck.

Rotalia orbicularis d'Orbigny.

Rotalia (*Gyroidina*) *orbicularis* d'Orbigny. 1826. Ann. Sci. Nat. vii. 278. No. 1 ; Modèle No. 13.

Rotalia orbicularis Brady. 1864. Trans. Linn. Soc. Lond. xxiv. 470. pl. xlviii. fig. 16.

Rotalia beccarii, var. *orbicularis* Parker and Jones. 1865. Phil. Trans. clv. 389. pl. xvi. fig. 34.

Rotalia orbicularis Terquem. 1882. Mém. Soc. géol. France. ser. 3. ii. Mém. III. 60. pl. iv. figs. 1–3.

Rotalia orbicularis Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 706. pl. cvii. fig. 5 ; pl. cxv. fig. 6.

"The test of *Rotalia orbicularis* is approximately plano-convex, the superior face being flat or only slightly arched, the inferior convex and more or less excavated at the umbilicus, and the peripheral edge subangular. It is isomorphous with *Truncatulina lobatula* in the Planorbuline series, and forms a connecting link between *Rotalia beccarii* and *Rotalia soldanii*.—Brady, loc. cit."

Locality. Timber Creek, in the yellow limestone. Rare. Teredo bed. Quite common.

NUMMULINIDÆ.

Sub-Family NUMMULITINÆ.

OPERCULINA d'Orbigny.

Operculina complanata, var. granulosa Leymerie.

Amphistegina fleuriausi d'Orbigny. 1826. Ann. Sci. Nat. vii. 304. No. 7. (name only, fide Reuss).

Operculina granulosa Leymerie. 1846. Mém. Soc. géol. France. ser. 2. i. 359. pl. xiii. fig. 12. a, b.

Amphistegina fleuriausi Reuss. 1861. Sitzungsb. d. K. Akad. Wiss. Wien. xliv. 308. pl. i. figs. 10–12.

Operculina irregularis Reuss. 1864. Denkschr. d. K. Acad. Wiss. Wien. xxiii. 10. pl. i. figs. 17, 18.

Operculina granulata Gümbel. 1868. Abhandl. d. K. bayer. Akad. d. Wiss. II. Cl. x. 663. pl. ii. fig. 111. a, b.

Operculina complanata, var. *granulosa* Brady. 1884. Report on Foram. H. M. S. Challenger. Zool. ix. 743. pl. cxii. figs. 6, 7, 9, 10.

Operculina complanata, var. *granulosa* Woodward and Thomas. 1885. Geol. Nat. Hist. Survey Minn. 13th Ann. Report. 176. pl. ii. fig. 36.

Operculina complanata, var. *granulosa* Woodward and Thomas. 1893. Final Report Geol. Nat. Hist. Survey Minn. iii. 46. pl. E. fig. 38.

Test. It is uniformly smaller than *complanata;* its partitions, which form a slight relief upon the surface of the very thin shell which encloses the convolutions, are proportionally more approximate. This species is very flat, and is made up of three or four spirals. It carries on its surface on each side a number of fine granulations, which are found irregularly distributed upon the little elevations which correspond to the interior partitions. These projecting points, scarce upon the last convolutions, are found crowded towards the centre in many individuals.

Locality. Stratton's marl pit, near Mullica Hill, in the shell layers of the green marl. Rare. New Egypt, in the green marl. Rare.

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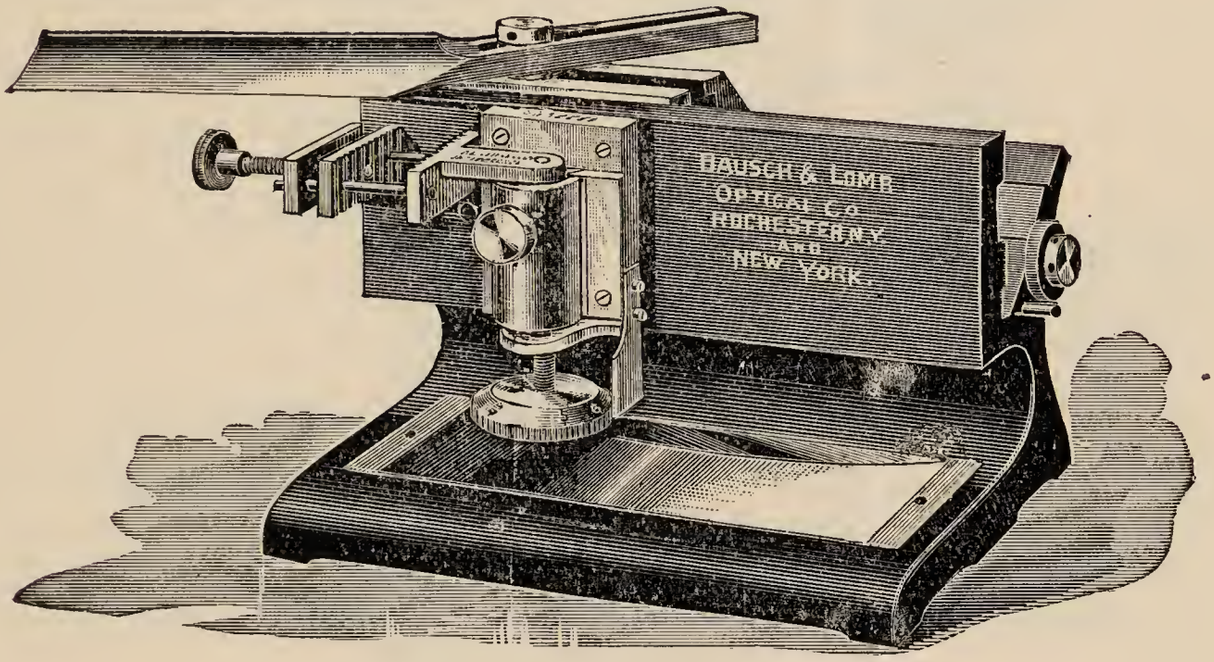

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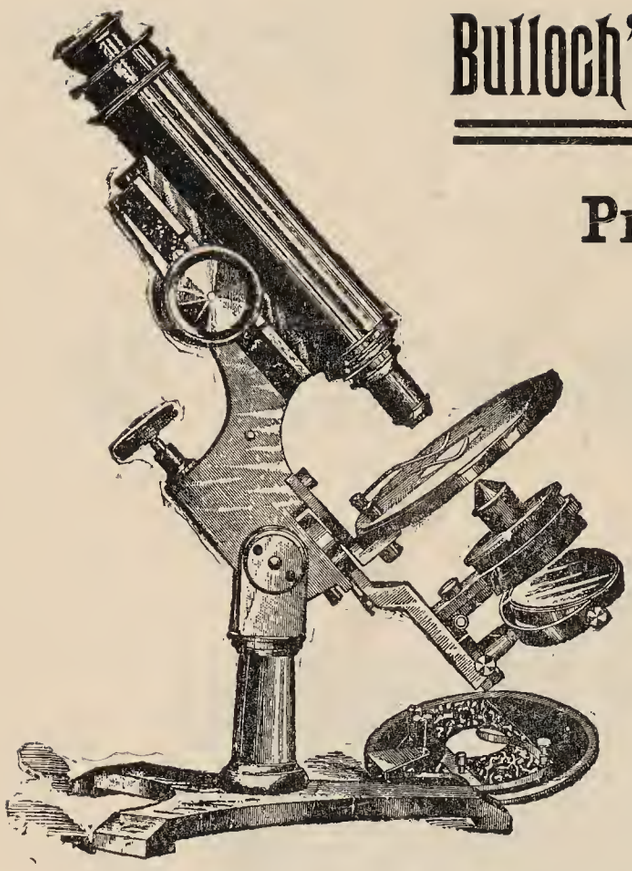

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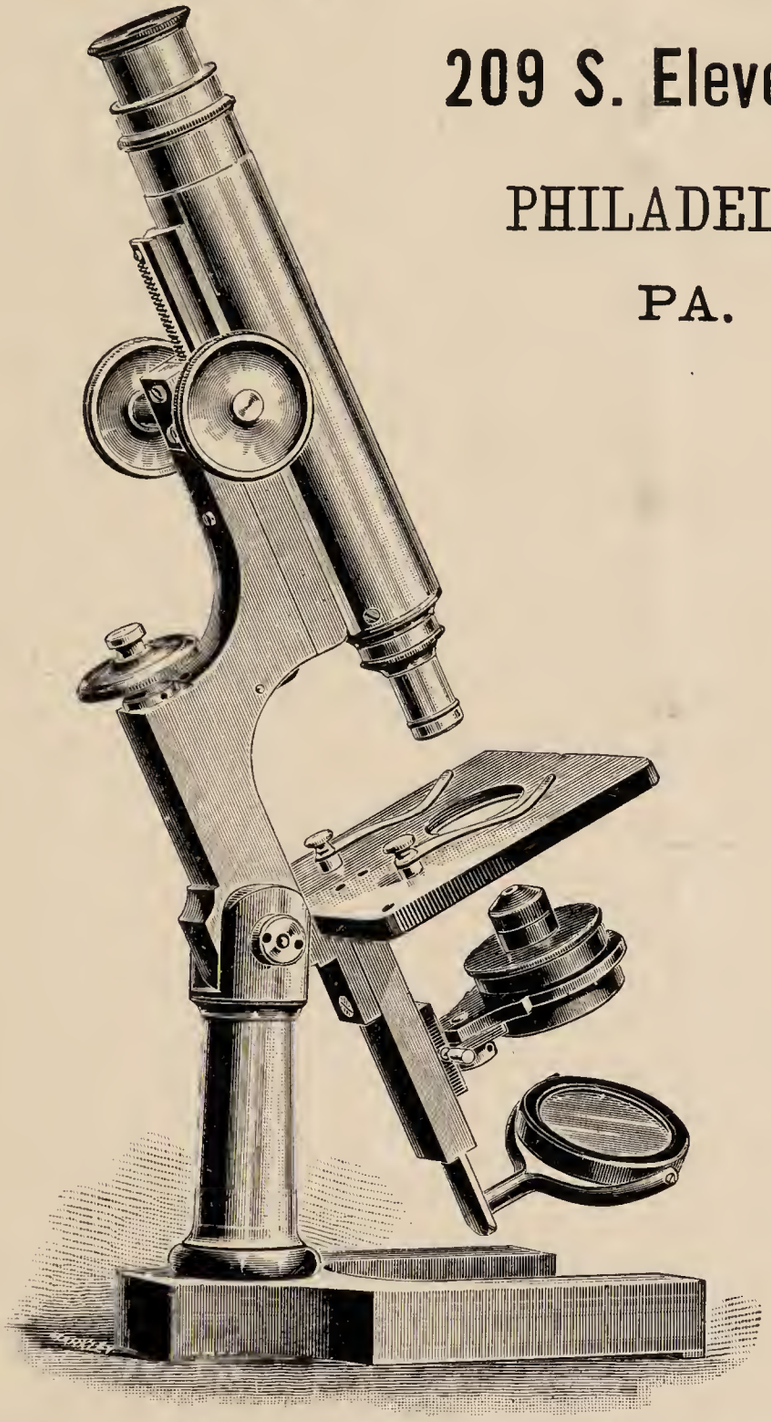

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